

Report Number: TRA-069522-47-02A
Issue: A

Report on the Radio Testing of a
Corrosion Radar Limited
GEN3 ExnR
With Respect to Specification
FCC 47CFR 15.247

TEST DATE: 2026-03-12 to 2026-03-18

Tested by: S Hodgkinson, M Else
Radio Test Engineer's

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Date: 2026-07-21

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[2] The results contained in this document relate only to the item(s) tested

RF915 Rev. 19



1 Revision Record

Issue	Issue Date	Revision History
A	2026-07-21	Original

2 Summary

Test Report Number:	TRA-069522-47-02A
Works Order Number:	TRA-069522-00
Purpose of Test:	Testing of Radio Frequency Equipment per the Relevant Authorisation Requirements of Chapter 47 of CFR (Code of Federal Regulations) Part 2, Subpart J
Test Specifications:	47CFR15.247
Equipment Under Test (EUT):	GEN3 ExnR
FCC Identifier:	2BTAH-GEN3EXNRRV3
EUT Serial Number:	261944
Manufacturer:	Corrosion Radar Limited
Address:	Future Business Centre King's Hedges Road Cambridge CB4 2HY United Kingdom
Client Contact:	Yoann Lage ☎ +44 (0)751-093-0722 ✉ y.lage@corrosionradar.com
Order Number:	CR-PO234
Test Date:	2026-03-12 to 2026-03-18
Tested By:	S Hodgkinson, M Else Element

2.1 Test Summary DTS Mode (A)

Test Method and Description		Requirement Clause FCC 47 CFR	Applicable to this equipment	Result / Note
Restricted Bands of Operation		15.205	☒	Pass
AC power line conducted emissions		15.207	☐	Note 1
6 dB bandwidth		15.247 (a) (2)	☒	Pass
Occupied bandwidth (99% bandwidth)		N/A	☒	Pass
Conducted output power	Peak	15.247 (b) (3)	☒	Pass
	Maximum		☐	
Undesirable / unwanted emissions		15.247 (d)	☒	Pass
Power spectral density		15.247 (e)	☒	Pass
Pulsed operation correction		15.35 (c)	☒	-

Specific notes:

1. The EUT is a battery powered device
2. The EUT was transmitting 100% in test modes provided by the client.
3. The equipment under test operates in the following modes LoRa, and LoRaWan
4. The equipment under test, as declared by the client is a hybrid device.
KDB 558074 D01 15.247 Measurement guidance v05r02, section 10 Hybrid System Equipment Under Section 15.247 was used for guidance, to cover the additional requirements for FHSS operation.
5. DTS Mode (A) of this test report covers the DTS requirement, as the equipment uses 500 kHz Bandwidth, FHSS Mode (B) of this test report covers the frequency hopping requirements (125 kHz Bandwidth).

General notes:

The results contained in this report relate only to the items tested, in the condition at time of test, and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. Any modifications made are identified in Section 8 of this report.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 5.2 of this test report (Deviations from Test Standards).

2.2 Test Summary FHSS Mode (B)

Test Method and Description	Requirement Clause 47CFR15	Applicable to this equipment	Result / Note
Radiated spurious emissions (restricted bands of operation and cabinet radiation)	15.247(d)	☒	Pass
AC power line conducted emissions	15.207	☐	Note 1
Carrier frequency separation	15.247 (a) (1)	☒	Pass
Number of hopping channels	15.247 (a) (1) (i), (ii) and (iii)	☒	Pass Note 2
Average time of occupancy	15.247 (a) (1) (i), (ii) and (iii)	☒	Pass
Maximum peak conducted output power	15.247 (a) (1), (b)(1) and (b)(2)	☒	Pass
20 dB emission bandwidth	15.247 (a) (1) (i) and (ii)	☒	Pass
Out-of-band emissions	15.247(d)	☒	Pass
Power spectral density	15.247 (e)	☐	Note 3

Specific notes:

1. The EUT is a battery powered device
2. The Equipment was tested as a Hybrid System using KDB 558074 D01 15.247 Measurement guidance v05r02 Section 10.
3. Not applicable in this mode of operation.

Operating mode for FHSS (125 kHz bandwidth).

The equipment enters an acquisition mode and starts frequency hopping across 64 channels, until communication is established with the LoRaWan network.

The LoRaWan network assigns one of the 8 frequency blocks. Each frequency block contains 8 frequency hopping channels.

Once communication is established between the network hub, and the EUT, the EUT starts to frequency hop across 8 channels within one of the 8 frequency blocks.

2.3 Hybrid System Equipment KDB 558074 D01 15.247 v05r02 Section 10

Hybrid system device measurement guidelines are as follows.

- 1) As specified in section 15.247 (f), a hybrid system must comply with power density standard of 8 dBm in any 3 kHz band, when the frequency hopping function is switched off.
- 2) The transmission must comply with a 0.4 second/channel maximum dwell time when hopping function is turned on.
- 3) There is no requirement for this type of hybrid system to comply with the 500 kHz minimum Bandwidth normally associated with a DTS device.
- 4) There is no minimum number of hopping channels associated with this type of hybrid system
While there is not a specific minimum limit, the hop sequence is required to appear as pseudorandom per section 15.247(a)(1).
- 5) The Hopping function must be a true frequency hopping system as described in section 15.247(a)(1). The specific requirements in section 15.247(a)(1) are:
 - i) a minimum channel separation
 - ii) pseudo-random hop sequence
 - iii) equal use of each frequency

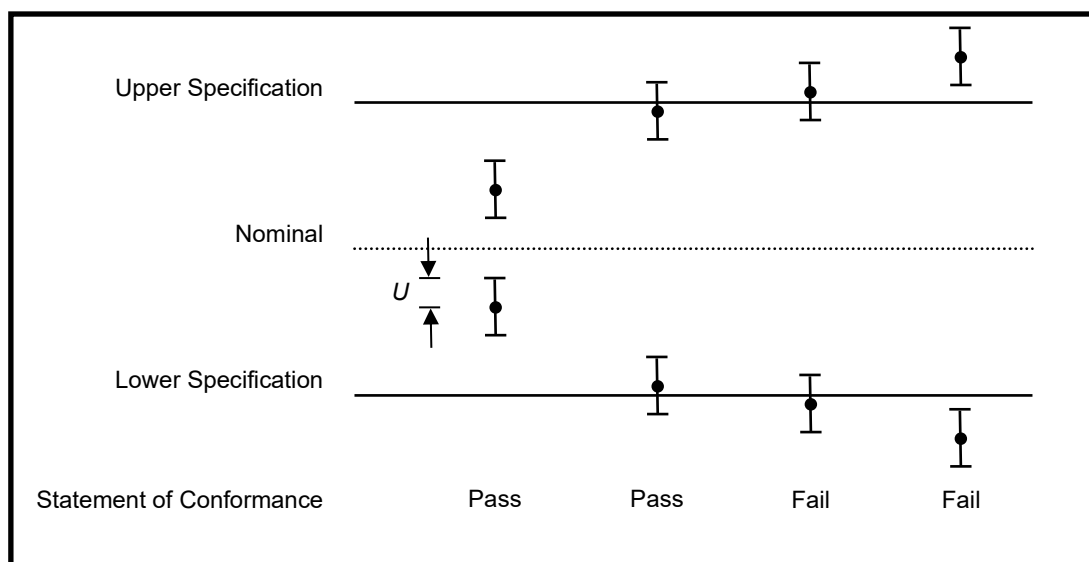
General notes:

The results contained in this report relate only to the items tested, in the condition at time of test, and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. Any modifications made are identified in Section 8 of this report.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 5.2 of this test report (Deviations from Test Standards).

Graphical Representation of a Pass / Fail Binary Statement - Simple Acceptance



● = Measured value

U = 95 % expanded measurement uncertainty

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4 Introduction

This report TRA-069522-47-02A presents the results of the Radio testing on a Corrosion Radar Limited , GEN3 ExnR to specification 47CFR15 Radio Frequency Devices.

The testing was carried out for Corrosion Radar Limited by Element, at the address detailed below.

☒	Element Skelmersdale Unit 1 Pendle Place Skelmersdale West Lancashire WN8 9PN UK	☐	Element Surrey Hills Unit 15 B Henley Business Park Pirbright Road Normandy Guildford GU3 2DX UK
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This report details the configuration of the equipment, the test methods used and any relevant modifications where appropriate.

All test and measurement equipment under the control of the laboratory and requiring calibration is subject to an established programme and procedures to control and maintain measurement standards. The quality management system meets the principles of ISO 9001, and has quality control procedures for monitoring the validity of tests undertaken. Records and sufficient detail are retained to establish an audit trail of calibration records relating to its test results for a defined period. Under control of the established calibration programme, key quantities or values of the test & measurement instrumentation are within specification and comply with the relevant traceable internationally recognised and appropriate standard specifications, which are ISO/IEC 17025:2017 accredited calibrated as such where these properties have a significant effect on results. Participation in inter-laboratory comparisons and proficiency testing ensures satisfactory correlation of results conform to Elements own procedures, as well as statistical techniques for analysis of test data providing the appropriate confidence in measurements.

Throughout this report EUT denotes equipment under test.

FCC Site Listing:

The test laboratory is accredited for the above sites under the following US-UK MRA, Designation numbers.

Element Surrey Hills	UK2027
Element Skelmersdale	UK2020

The test site requirements of ANSI C63.4-2014 + C63.4a-2017 are met up to 1 GHz.

The test site S_{VSWR} requirements of CISPR 16-1-4:2019 are met over the frequency range 1 GHz to 18 GHz.

5 Test Specifications

5.1 *Normative References*

- FCC 47 CFR Ch. I – Part 15 – Radio Frequency Devices.
- ANSI C63.10-2020 + Cor. 1-2023 + C63.10a-2024 – American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- ANSI C63.4-2014 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
- KDB 558074 D01 15.247 Measurement guidance v05r02

5.2 *Deviations from Test Standards*

There were no deviations from the test standard.

6 Glossary of Terms

§	denotes a section reference from the standard, not this document
AC	Alternating Current
ANSI	American National Standards Institute
BW	bandwidth
C	Celsius
CFR	Code of Federal Regulations
CW	Continuous Wave
dB	decibel
dBm	dB relative to 1 milliwatt
DC	Direct Current
DSSS	Direct Sequence Spread Spectrum
EIRP	Equivalent Isotropically Radiated Power
ERP	Effective Radiated Power
EUT	Equipment under Test
FCC	Federal Communications Commission
FHSS	Frequency Hopping Spread Spectrum
Hz	hertz
IC	Industry Canada
ITU	International Telecommunication Union
LBT	Listen before Talk
m	metre
max	maximum
MIMO	Multiple Input and Multiple Output
min	minimum
MRA	Mutual Recognition Agreement
N/A	Not Applicable
PCB	Printed Circuit Board
PDF	Portable Document Format
Pt-mpt	Point-to-multipoint
Pt-pt	Point-to-point
RF	Radio Frequency
RH	Relative Humidity
RMS	Root Mean Square
Rx	receiver
s	second
SVSWR	Site Voltage Standing Wave Ratio
Tx	transmitter
UKAS	United Kingdom Accreditation Service
V	volt
W	watt
Ω	ohm

7 Equipment under Test

7.1 EUT Identification

- Name: GEN3 ExnR
- Serial Number: 261944
- Model Number: GEN3-EXNR-NA
- Software Revision: Production firmware GEN3 V61
- Build Level / Revision Number: Production

7.2 System Equipment

Equipment listed below forms part of the overall test setup and is required for equipment functionality and/or monitoring during testing. The compliance levels achieved in this report relate only to the EUT and not items given in the following list.

- Test Laptop; DELL Latitude: 3400; Service Code: 12981819206

7.3 EUT Mode of Operation

The EUT was set to transmit a modulated carrier on the frequencies as indicated.

7.4 EUT Radio Parameters

7.4.1 General DTS Mode (A)

Frequencies of operation:	902 MHz - 928 MHz Band
Modulation type(s):	LoRa Chirp Spread Spectrum
Occupied channel bandwidth(s):	500 kHz
Rated Output Power:	+18.5 dBm
Nominal Supply Voltage:	6 Vdc Li-MnO2 battery

7.4.1 General FHSS Mode (B)

Frequencies of operation:	902 MHz - 928 MHz Band
Modulation type(s):	LoRa Chirp Spread Spectrum
Occupied channel bandwidth(s):	125 kHz
Rated Output Power:	+18.5 dBm
Nominal Supply Voltage:	6 Vdc Li-MnO2 battery

7.4.2 Antennas

Type:	iANT213-QB
Frequency range:	790 MHz - 960 MHz
Impedance:	50 Ω
SWR:	2.0
Gain:	2.3 dBi Peak
Polarisation:	Vertical
Beam width:	360 °
Connector type:	N jack (female).
Dimensions:	H263 x D32 mm
Weight:	40g
Environmental limits:	-45°C to +85°C
Mounting:	Bracket

7.5 EUT Description

The EUT is a Corrosion Monitoring Node with Bluetooth LE and LoRa technology.

This test report covers the testing of the LoRa and LoRaWan modes of operation only.

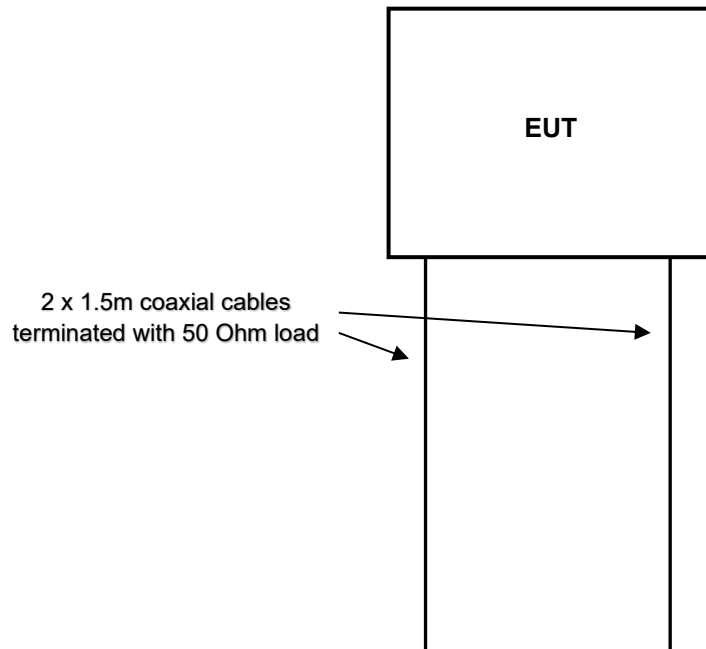
8 Modifications

No modifications were performed during this assessment.

9 EUT Test Setup

9.1 Block Diagram

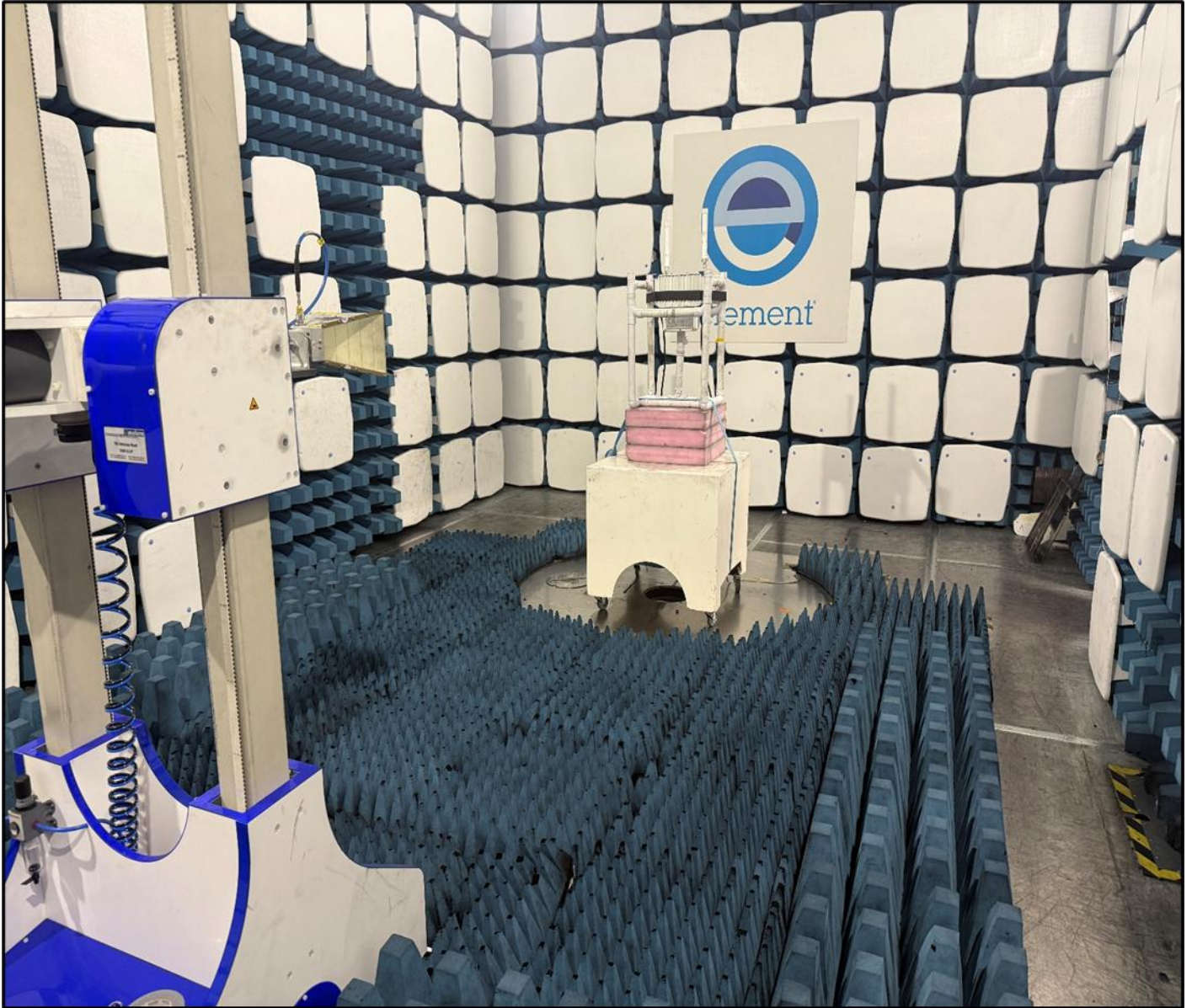
The following diagram shows basic EUT interconnections with cable type and cable lengths identified:



9.2 General Set-up Photographs

The following photographs show basic EUT set-up:





9.3 *Measurement software*

Where applicable, the following software was used to perform measurements contained within this report.

Element Emissions R5: 2025.04.30.2
Element Transmitter Bench Test

Note:

The version of the Element software used is recorded in the results sheets contained within this report.

10 General Technical Parameters

10.1 Normal Conditions

The EUT was tested under the normal environmental conditions of the test laboratory, except where otherwise stated. The normal power source applied was 6 Vdc from a Li-MnO₂ battery.

10.2 Varying Test Conditions

There are no specific frequency stability requirements for the type of device. The results contained in this report demonstrate that the occupied bandwidth is contained within the authorised band.

Variation of supply voltage is required to ensure stability of the declared output power. During carrier power testing the following variations were made:

	Category	Nominal	Variation
☐	Mains	110 Vac +/- 2 %	85 % and 115 %
☒	Battery	Fully Charged Battery	N/A

11 Results Section DTS Mode (A)

12 Radiated emissions

12.1 Definitions

Out-of-band emissions

Emissions on a frequency or frequencies immediately outside the necessary bandwidth which result from the modulation process, but exclude spurious emissions.

Spurious emissions

Emissions on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

Restricted bands

A frequency band in which intentional radiators are permitted to radiate only spurious emissions but not fundamental signals.

12.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	REF940
Test Standard and Clause:	ANSI C63.10-2020, Clause 6.5 and 6.6
EUT Frequencies Measured:	903.0 MHz, 915.0 MHz & 927.5 MHz
EUT Channel Bandwidths:	500 kHz
Deviations From Standard:	None
Measurement BW:	30 MHz to 1 GHz: 120 kHz; Above 1 GHz: 1 MHz
Measurement Detector:	Up to 1 GHz: quasi-peak; Above 1 GHz: RMS average and Peak

Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 °C to +35 °C (as declared)
Humidity: 36 % RH	20 % RH to 75 % RH (as declared)
Supply: 6 Vdc	As declared

12.3 Test Limit

Except for harmonics, out-of-band emissions shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in FCC 47CFR15.209 / RSS-Gen {see table below}, whichever is less stringent.

Harmonics shall be limited to a maximum level of 0.5 mV/m measured at 3 metres.

General Field Strength Limits for License-Exempt Transmitters at Frequencies above 30 MHz

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

n.b. per FCC 47CFR15.35(b) / RSS-Gen 8.1, peak limit is 20 dB above average.

12.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure i, the emissions from the EUT were measured on a spectrum analyzer / EMI receiver.

Radiated electromagnetic emissions from the EUT are checked first by preview scans. Preview scans for all spectrum and modulation characteristics are checked, using a peak detector and where applicable worst-case determined for function, operation, orientation, etc. for both vertical and horizontal polarisations. Pre-scan plots are shown with a peak detector and 100 kHz RBW.

If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in ANSI C63.10 are followed. Alternatively, a layout closest to normal use (as declared by the provider) is employed, (see EUT setup photographs for more detail).

Emissions between 30 MHz and 1 GHz are measured using calibrated broadband antennas. Emissions above 1 GHz are characterized using standard gain horn antennas. Pre-amplifiers and filters are used where required. Care is taken to ensure that test receiver resolution bandwidth, video bandwidth and detector type(s) meet the regulatory requirements.

For both horizontal and vertical polarizations, the EUT is then rotated through 360 degrees in azimuth until the highest emission is detected. At the previously determined azimuth the test antenna is raised and lowered from 1 to 4 m in height until a maximum emission level is detected, this maximum value is recorded.

Power values measured on the test receiver / analyzer are converted to field strength, FS, in dBμV/m at the regulatory distance, using:

$$FS = PR + CL + AF - PA + DC - CF$$

$$\text{Factor} = CL + AF - PA$$

Where,

PR is the power recorded on the receiver / spectrum analyzer in dBμV;

CL is the cable loss in dB;

AF is the test antenna factor in dB/m;

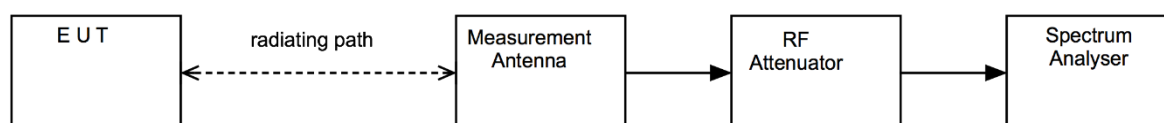
PA is the pre-amplifier gain in dB (where used);

DC is the duty correction factor in dB (where used, e.g. harmonics of pulsed fundamental);

CF is the distance factor in dB (where measurement distance different to limit distance);

This field strength value is then compared with the regulatory limit.

Figure i Test Setup

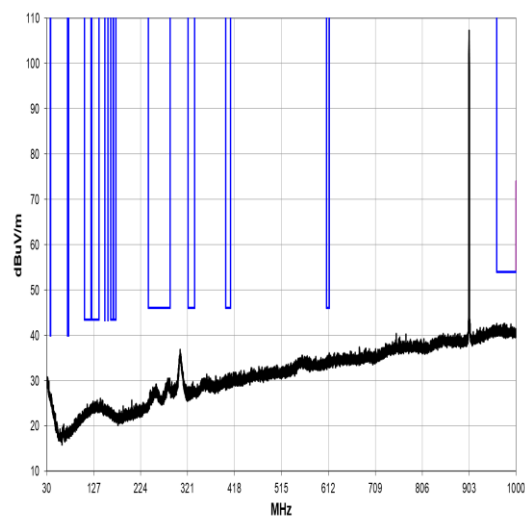


12.5 Test Equipment

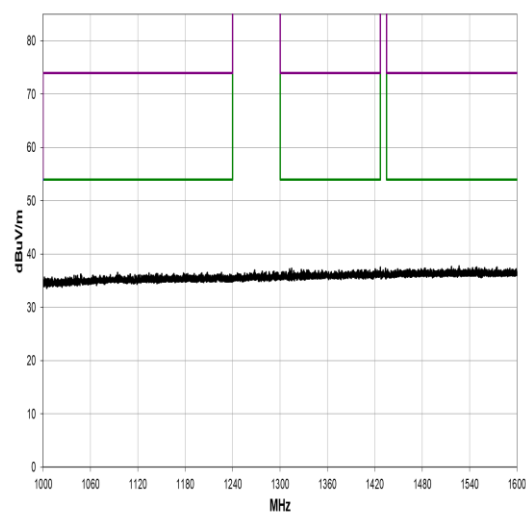
<i>Equipment Type</i>	<i>Manufacturer</i>	<i>Equipment Description</i>	<i>Element No</i>	<i>Due For Calibration</i>
Emissions R5	Element	Radiated Test Software	REF9000	Cal Not Required
ATS	Rainford EMC	Radio Chamber - PP	REF940	2028-01-19
ESR26	R&S	EMI Receiver	U489	2026-11-19
3115	EMCO	Horn Antenna	L138	2026-06-11
PAM-118A	COM-POWER	500 MHz -18 GHz Pre Amp	U1016	2026-06-20
VHF-3100+	MiniCircuits	3.1 GHz High Pass Filter	U718	2027-02-24
VHF-1500+	MiniCircuits	High Pass Filter	U519	2027-02-17
AFH-05000 Rev A	Atlantic Microwave	HI Pass Filter 5-16 GHz	U663	2027-02-12
CBL611/B	Chase	Bilog	U573	2026-11-04
LNA6901	AMETEK	Pre Amp	U711	2026-04-24

12.6 Test Results

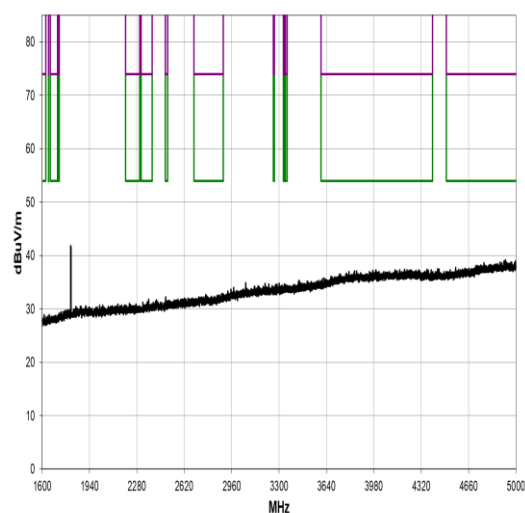
500 kHz LoRa; Bottom Channel; Frequency: 903.0 MHz; Power Setting: 14 dBm;
Spreading Factor: SF7; Coding Rate: 4/5; Mode: PA Boost; Interval: 400 ms; Payload: 16



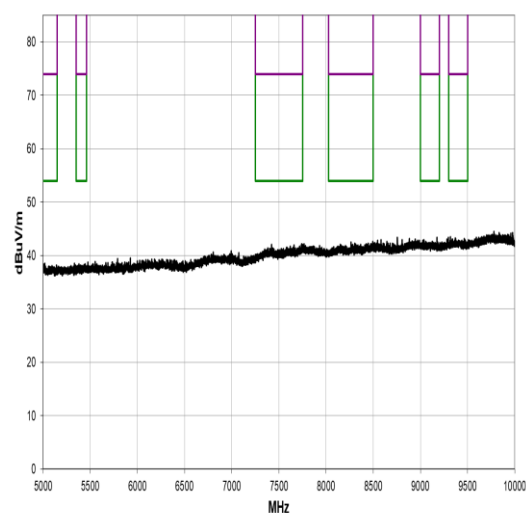
30 MHz to 1 GHz



1 GHz to 1.6 GHz



1.6 GHz to 5 GHz

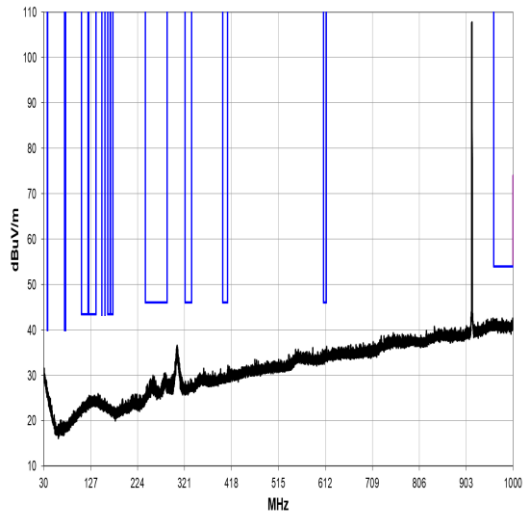


5 GHz to 10 GHz

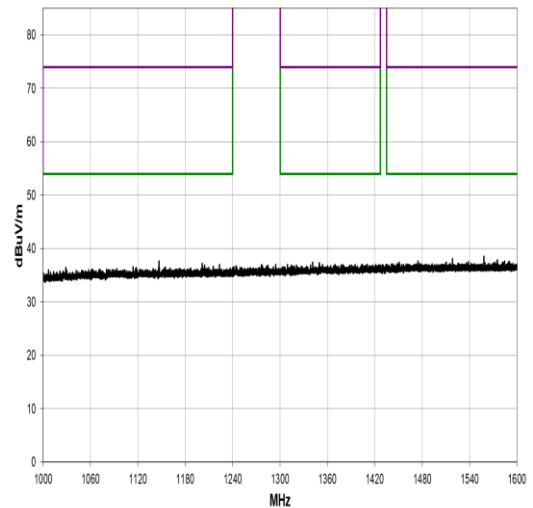
500 kHz LoRa, Bottom Channel; Frequency: 903.0 MHz; Power Setting: 14 dBm;
Spreading Factor: SF7; Coding Rate: 4/5; Mode: PA Boost; Interval: 400 ms; Payload: 16

Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Duty Cycle Corr'n (dB)	Distance Extrap'n Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No emissions within 20 dB of the limit								

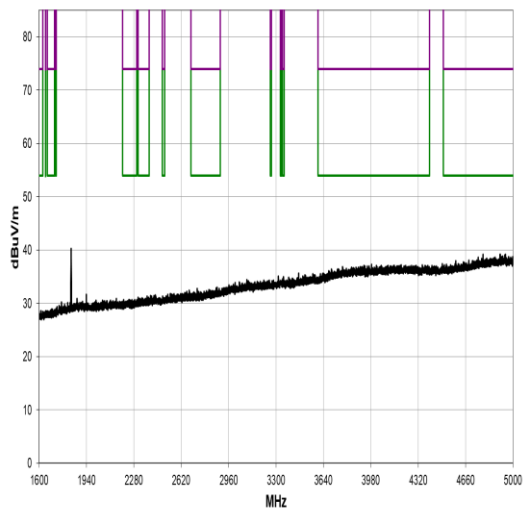
500 kHz LoRa; Middle Channel; Frequency: 915.0 MHz; Power Setting: 14 dBm;
 Spreading Factor: SF7; Coding Rate: 4/5; Mode: PA Boost; Interval: 400 ms; Payload: 16



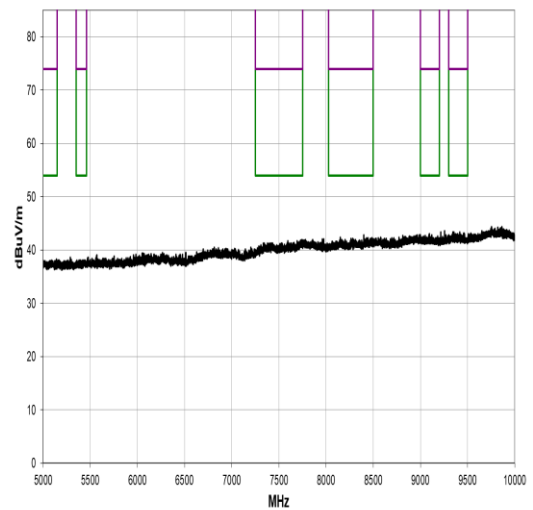
30 MHz to 1 GHz



1 GHz to 1.6 GHz



1.6 GHz to 5 GHz

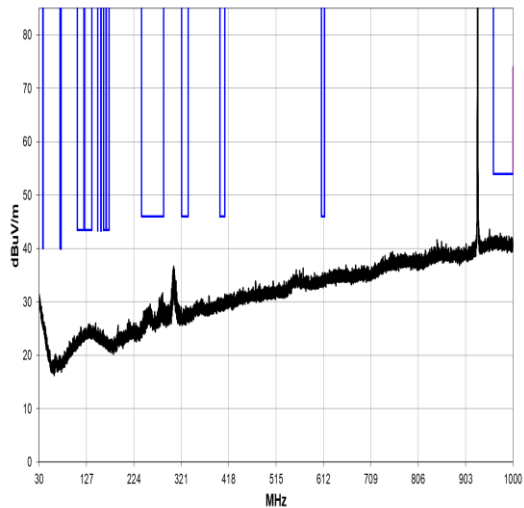


5 GHz to 10 GHz

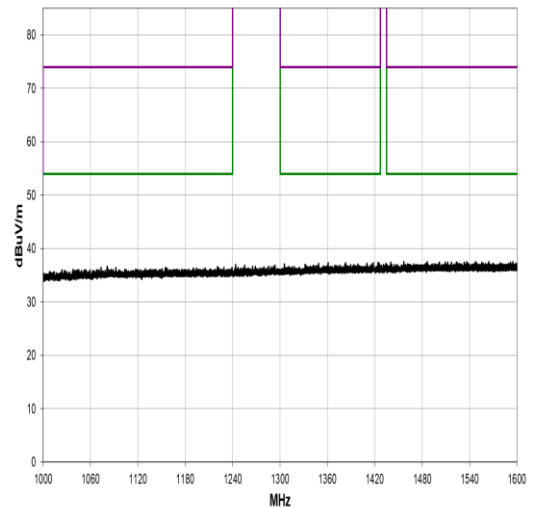
500 kHz LoRa; Middle Channel; Frequency: 915.0 MHz; Power Setting: 14 dBm;
 Spreading Factor: SF7; Coding Rate: 4/5; Mode: PA Boost; Interval: 400 ms; Payload: 16

Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Duty Cycle Corr'n (dB)	Distance Extrap'n Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No emissions within 20 dB of the limit								

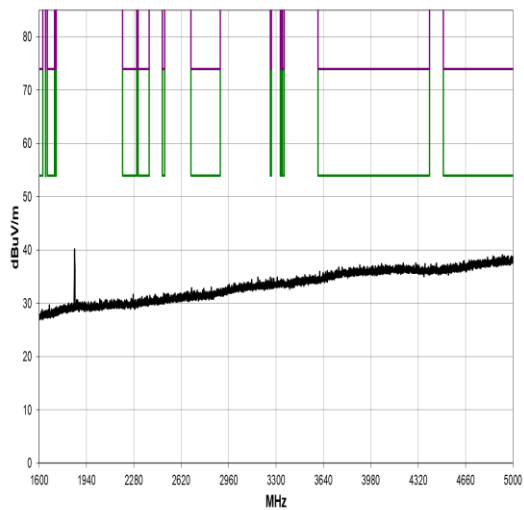
500 kHz LoRa; Top Channel; Frequency: 927.5 MHz; Power Setting: 14 dBm;
 Spreading Factor: SF7; Coding Rate: 4/5; Mode: PA Boost; Interval: 400 ms; Payload: 16



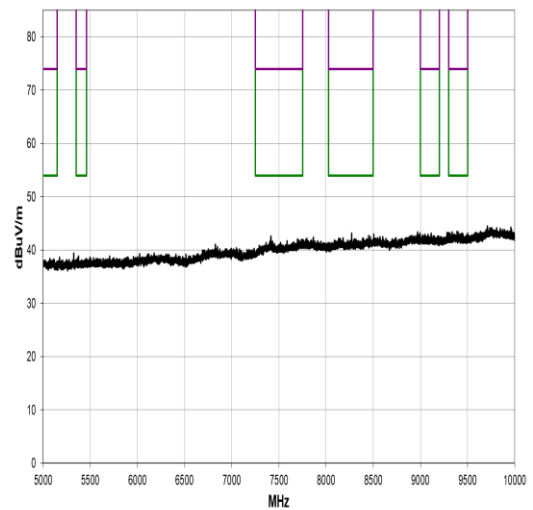
30 MHz to 1 GHz



1 GHz to 1.6 GHz



1.6 GHz to 5 GHz



5 GHz to 10 GHz

500 kHz LoRa; Top Channel; Frequency: 927.5 MHz; Power Setting: 14 dBm;
 Spreading Factor: SF7; Coding Rate: 4/5; Mode: PA Boost; Interval: 400 ms; Payload: 16

Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Duty Cycle Corr'n (dB)	Distance Extrap'n Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No emissions within 20 dB of the limit								

13 Occupied Bandwidth

13.1 Definition

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal.

The 99% emission bandwidth is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained.

13.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2020, Clause 11.8
EUT Frequencies Measured:	903.0 MHz, 915.0 MHz & 927.5 MHz
EUT Channel Bandwidths:	500 kHz
EUT Test Modulations:	LoRa Chirp Spread Spectrum
Deviations From Standard:	None
Measurement BW: (6 dB requirement: 100 kHz; 99% requirement: 1% to 5% OBW)	100 kHz
Spectrum Analyzer Video BW: (requirement at least 3x RBW)	300 kHz
Measurement Span: (requirement 2 to 5 times OBW)	3 MHz
Measurement Detector:	Peak

Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 °C to +35 °C (as declared)
Humidity: 40 % RH	20 % RH to 75 % RH (as declared)
Supply: 6 Vdc	As declared

13.3 Test Limit

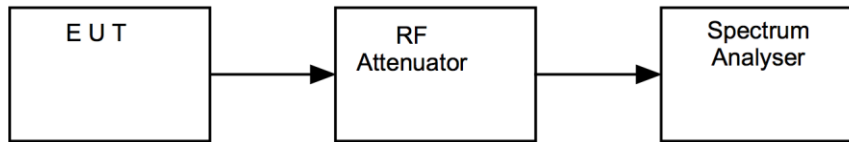
The minimum -6 dB bandwidth shall be at least 500 kHz.

13.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure iii, the bandwidth of the EUT was measured on a spectrum analyser.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst-case configuration in each bandwidth.

Figure iii Test Setup

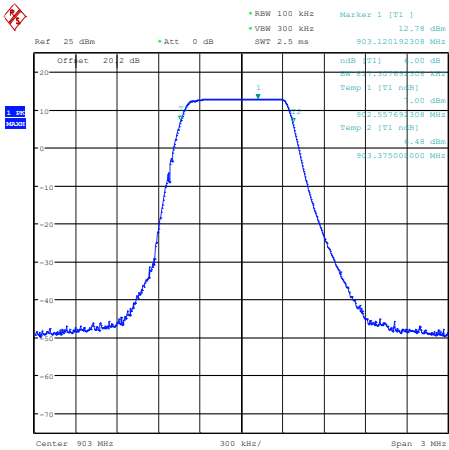


13.5 Test Equipment

<i>Equipment Type</i>	<i>Manufacturer</i>	<i>Equipment Description</i>	<i>Element No</i>	<i>Due For Calibration</i>
FSU50	R&S	Spectrum Analyser	U544	2026-12-22
SMBV100A	R&S	Signal Generator	U674	2026-06-16
AS7836	AtlanTecRF	100W 20 dB Attenuator	U598	Cal in Use
IPS 303A	ISO-Tech	Power Supply	U747	Use REF976
34405a	Agilent	Multimeter	REF976	2027-02-16

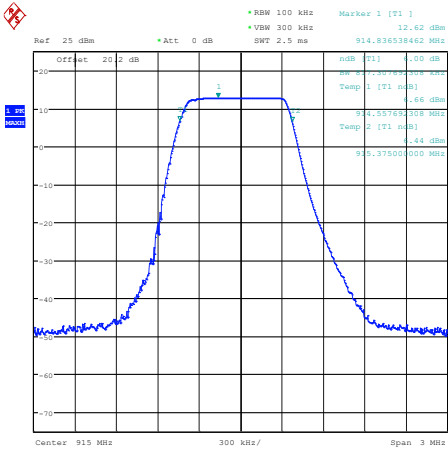
13.6 Test Results

Bandwidth Type: 6 dB; 500 kHz Operation; Power Setting: 14 dBm				
Frequency (MHz)	F_L (MHz)	F_H (MHz)	Bandwidth (kHz)	Result
903.0	902.557692308	903.375000000	817.307	Pass
915.0	914.557692308	915.375000000	817.307	Pass
927.5	927.057692308	927.875000000	817.307	Pass



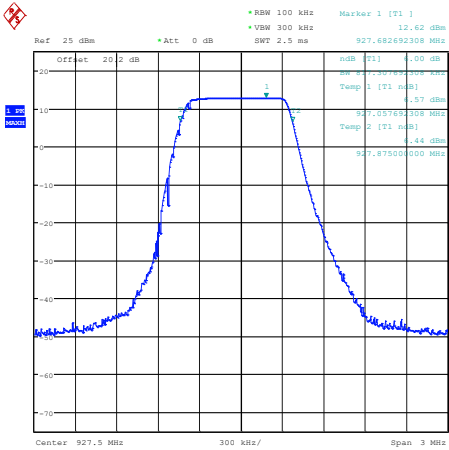
Date: 9.MAR.2026 15:13:01

903.0 MHz



Date: 9.MAR.2026 15:27:49

915.0 MHz



Date: 9.MAR.2026 16:28:02

927.5 MHz

14 Maximum peak conducted output power

14.1 Definition

The maximum peak conducted output power is defined as the maximum power level measured with a peak detector using a filter with width and shape of which is sufficient to accept the signal bandwidth.

14.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2013, Clause 11.9.1
EUT Frequencies Measured:	903.0 MHz, 915.0 MHz & 927.5 MHz
EUT Channel Bandwidths:	500 kHz
Deviations From Standard:	None
Measurement BW:	1 MHz
Spectrum Analyzer Video BW: (requirement at least 3x RBW)	3 MHz
Measurement Detector:	Peak
Voltage Extreme Environment Test Range:	Battery Power = new battery.

Environmental Conditions (Normal Environment)

Temperature: 22.6 °C	+15 °C to +35 °C (as declared)
Humidity: 40.0 % RH	20 % RH to 75 % RH (as declared)

14.3 Test Limit

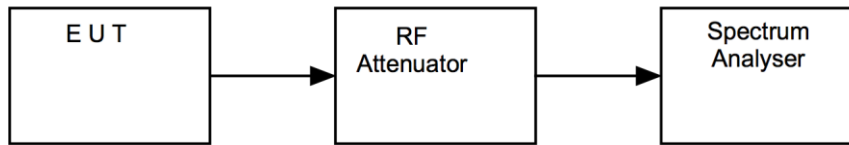
For systems employing digital modulation techniques operating in the bands 902 to 928 MHz, 2400 to 2483.5 MHz and 5725 to 5850 MHz, the maximum peak conducted output power shall not exceed 1 W.

14.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure iv, the resolution bandwidth of the spectrum analyser was increased above the EUT occupied bandwidth and the peak emission data noted.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst-case configuration in each bandwidth.

Figure iv Test Setup

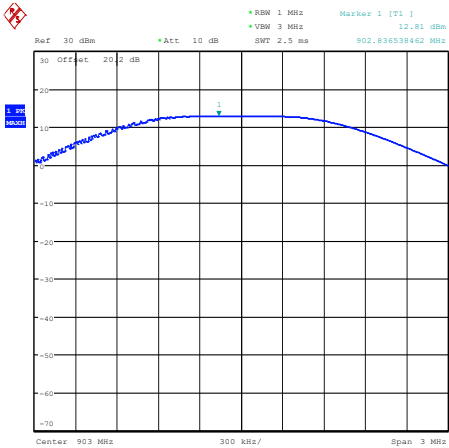


14.5 Test Equipment

<i>Equipment Type</i>	<i>Manufacturer</i>	<i>Equipment Description</i>	<i>Element No</i>	<i>Due For Calibration</i>
FSU50	R&S	Spectrum Analyser	U544	2026-12-22
SMBV100A	R&S	Signal Generator	U674	2026-06-16
AS7836	AtlanTecRF	100W 20 dB Attenuator	U598	Cal in Use
IPS 303A	ISO-Tech	Power Supply	U747	Use REF976
34405a	Agilent	Multimeter	REF976	2027-02-16

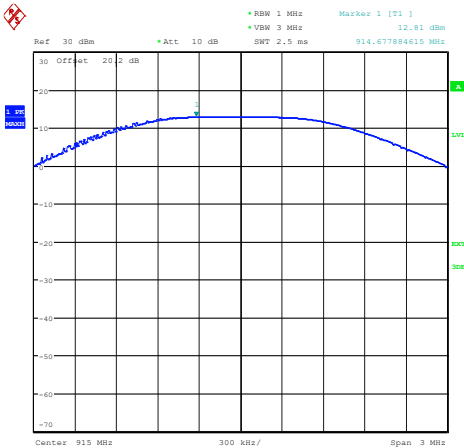
14.6 Test Results

LoRa 500 kHz Channel; Power Setting: 14 dBm; Spreading Factor: SF7			
Frequency (MHz)	Maximum peak conducted output power		Result
	(dBm)	(W)	
903.00	12.81	0.02	Pass
915.00	12.81	0.02	Pass
927.50	12.88	0.02	Pass



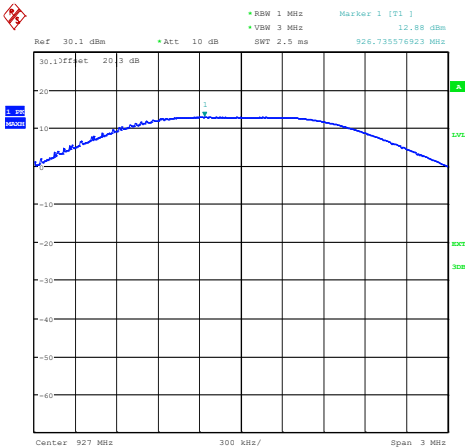
Date: 10.MAR.2026 10:41:23

903.0 MHz



Date: 10.MAR.2026 10:42:32

915.0 MHz



Date: 10.MAR.2026 10:45:51

927.5 MHz

15 Out-of-band and conducted spurious emissions

15.1 Definition

Out-of-band emission.

Emission on a frequency or frequencies immediately outside the necessary bandwidth that results from the modulation process but excluding spurious emissions.

Spurious emission.

Emission on a frequency or frequencies that are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products, and frequency conversion products, but exclude out-of-band emissions.

15.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2020, Clause 11.11
Frequencies Measured:	903.0 MHz, 915.0 MHz & 927.5 MHz
EUT Channel Bandwidths:	500 kHz
Deviations From Standard:	None
Measurement BW:	100 kHz
Spectrum Analyzer Video BW: (requirement at least 3x RBW)	300 kHz
Measurement Detector:	Peak
Measurement Range:	9 kHz to 10 GHz

Environmental Conditions (Normal Environment)

Temperature: 23 °C	+15 °C to +35 °C (as declared)
Humidity: 40 % RH	20 % RH to 75 % RH (as declared)
Supply: 6 Vdc	As declared

15.3 Test Limit

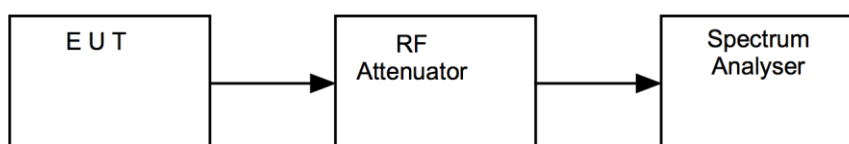
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in FCC 47CFR15.209(a) / RSS-Gen is not required.

15.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure v, the emissions from the EUT were measured on a spectrum analyser.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst case configuration in each bandwidth.

Figure v Test Setup

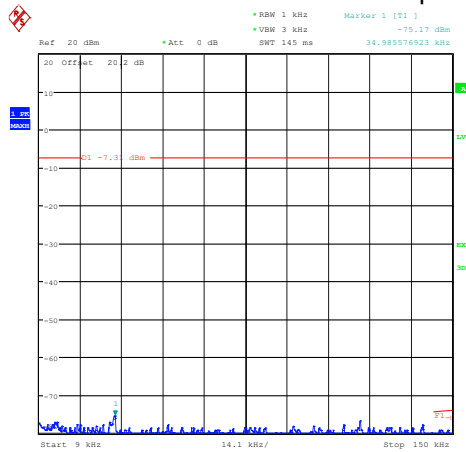


15.5 Test Equipment

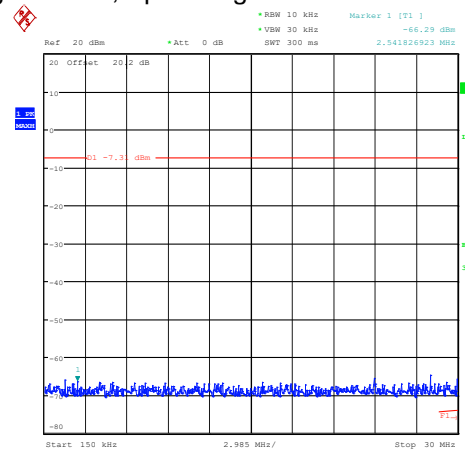
<i>Equipment Type</i>	<i>Manufacturer</i>	<i>Equipment Description</i>	<i>Element No</i>	<i>Due For Calibration</i>
FSU50	R&S	Spectrum Analyser	U544	2026-12-22
SMBV100A	R&S	Signal Generator	U674	2026-06-16
AS7836	AtlanTecRF	100W 20 dB Attenuator	U598	Cal in Use
IPS 303A	ISO-Tech	Power Supply	U747	Use REF976
34405a	Agilent	Multimeter	REF976	2027-02-16

15.6 Test Results

903.0 MHz 500 kHz Operation; Power Setting: 14 dBm; Spreading Factor: SF7

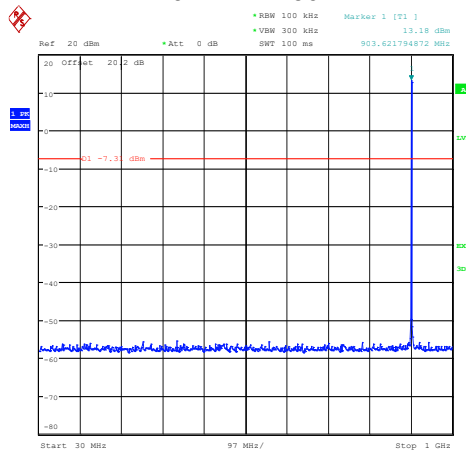


Date: 10.MAR.2026 14:39:24



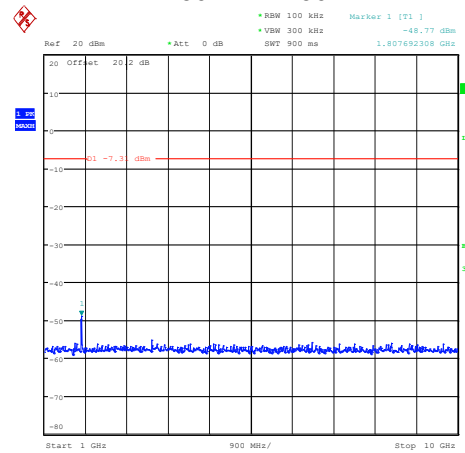
Date: 10.MAR.2026 14:40:54

9 kHz to 150 kHz



Date: 10.MAR.2026 14:42:11

150 kHz to 30 MHz



Date: 10.MAR.2026 14:43:01

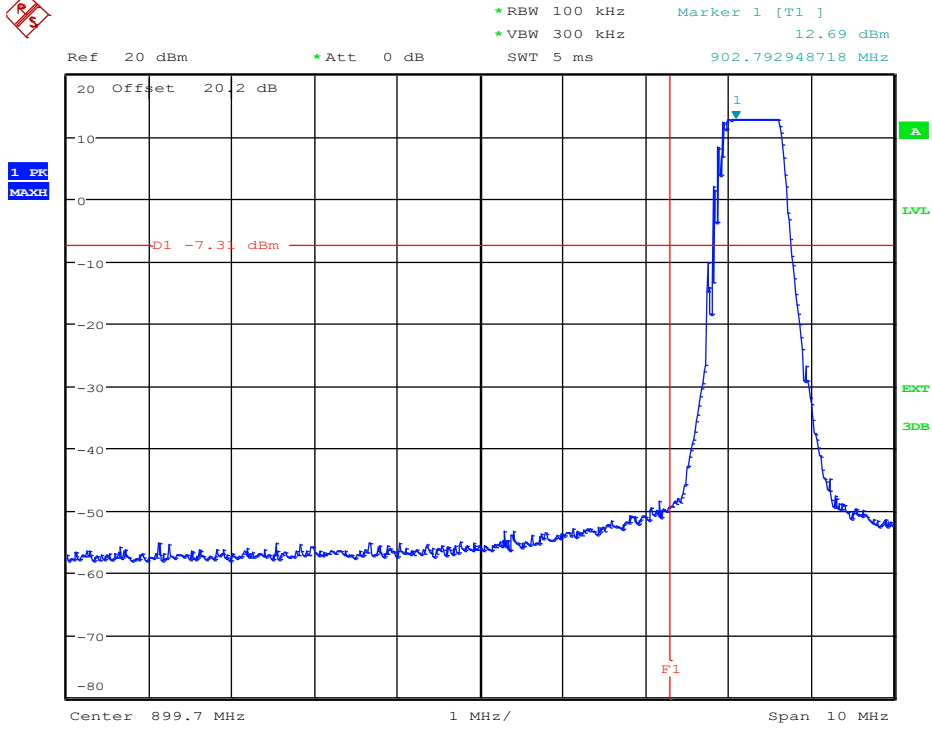
30 MHz to 1 GHz

1 GHz to 10 GHz

903.0 MHz 500 kHz Operation; Power Setting: 14 dBm; Spreading Factor: SF7

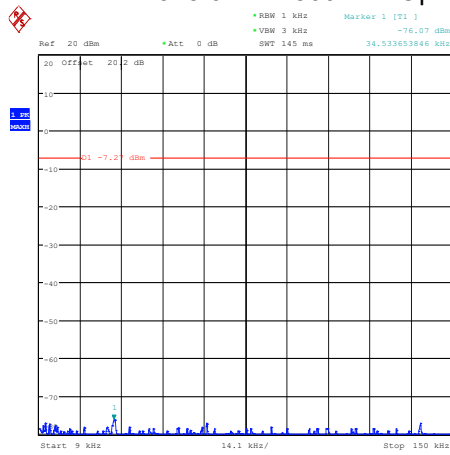
Channel Frequency (MHz)	Emission Frequency (MHz)	Analyzer Level (dBm)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
No Significant emissions within 20 dBm of the limit						Pass

Lower Conducted Band Edge

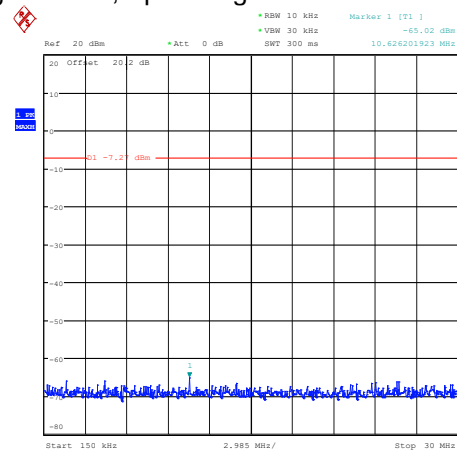


Date: 10.MAR.2026 14:38:18

915.0 MHz 500 kHz Operation; Power Setting: 14 dBm; Spreading Factor: SF7

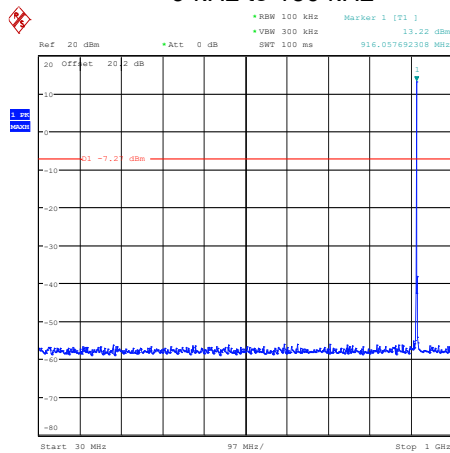


Date: 10.MAR.2026 15:00:32



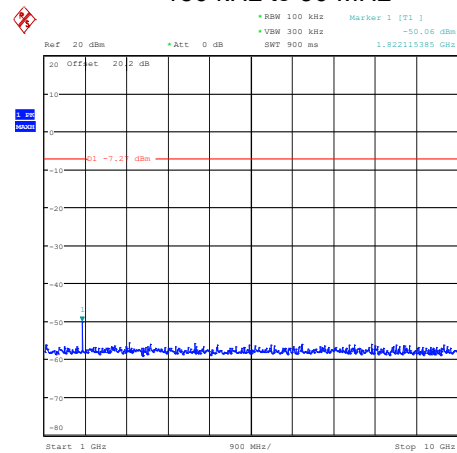
Date: 10.MAR.2026 15:01:04

9 kHz to 150 kHz



Date: 10.MAR.2026 15:01:49

150 kHz to 30 MHz



Date: 10.MAR.2026 15:02:23

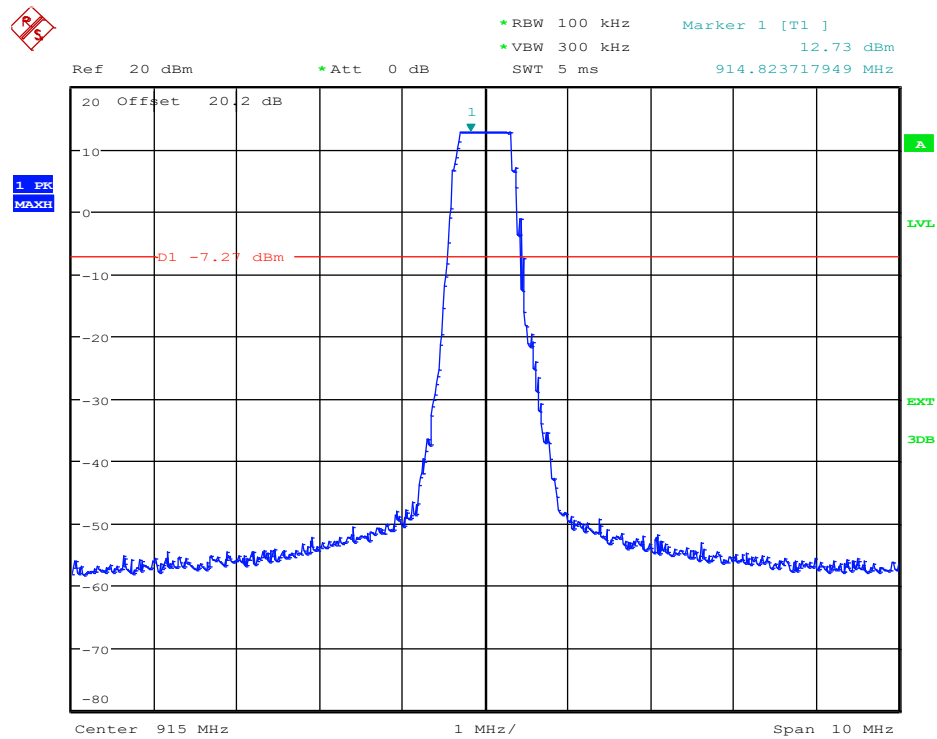
30 MHz to 1 GHz

1 GHz to 10 GHz

915.0 MHz 500 kHz Operation; Power Setting: 14 dBm; Spreading Factor: SF7

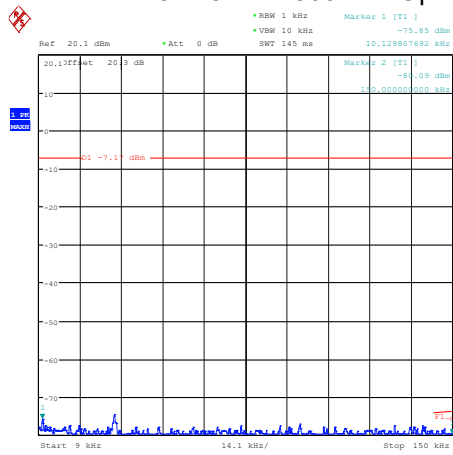
Channel Frequency (MHz)	Emission Frequency (MHz)	Analyzer Level (dBm)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
No Significant emissions within 20 dBm of the limit						Pass

Middle Channel Limit Reference Plot

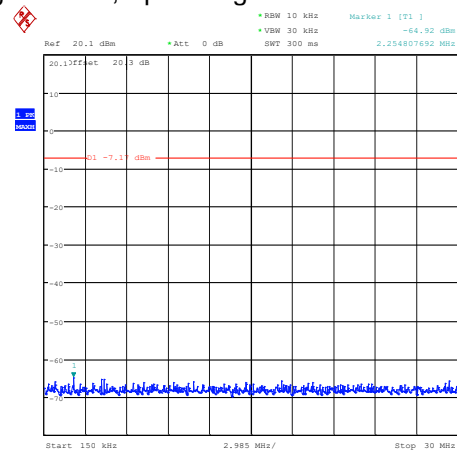


Date: 10.MAR.2026 15:00:02

927.5 MHz 500 kHz Operation; Power Setting: 14 dBm; Spreading Factor: SF7

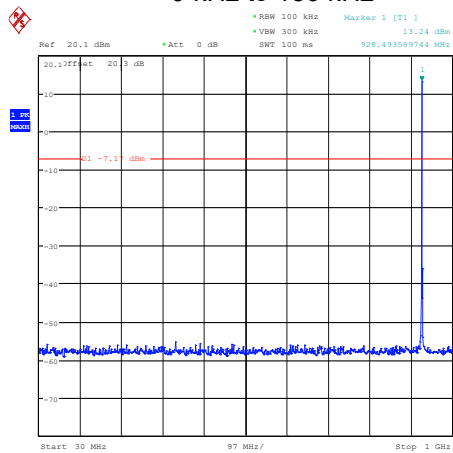


Date: 10.MAR.2026 15:25:59



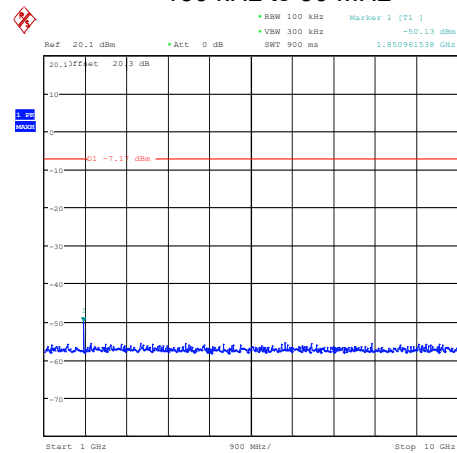
Date: 10.MAR.2026 15:26:52

9 kHz to 150 kHz



Date: 10.MAR.2026 15:27:26

150 kHz to 30 MHz



Date: 10.MAR.2026 15:28:32

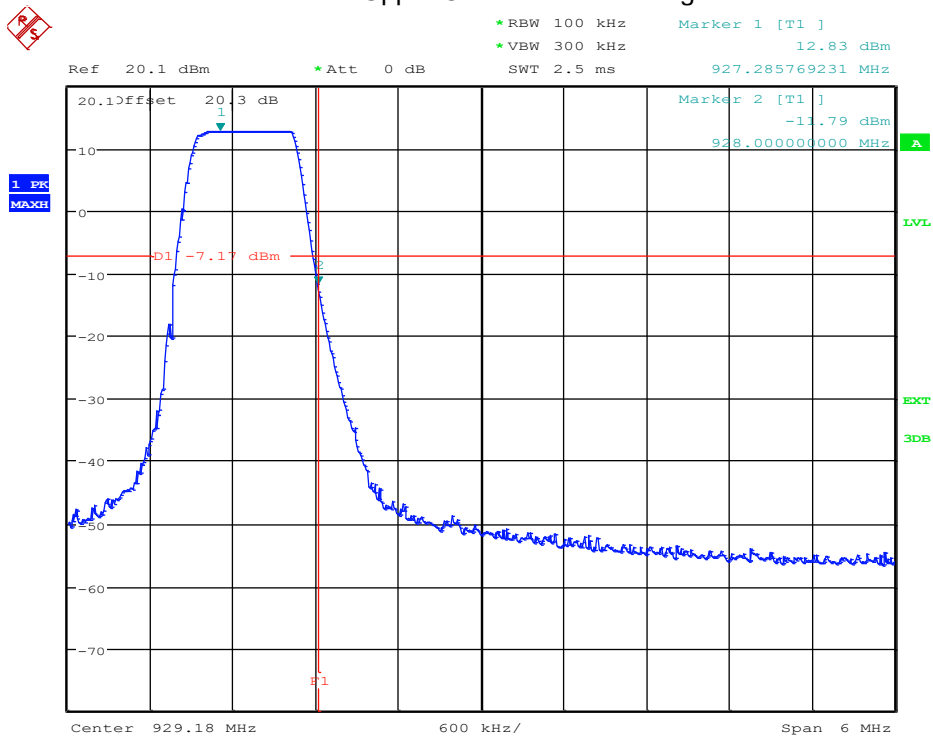
30 MHz to 1 GHz

1 GHz to 10 GHz

927.5 MHz 500 kHz Operation; Power Setting: 14 dBm; Spreading Factor: SF7

Channel Frequency (MHz)	Emission Frequency (MHz)	Analyzer Level (dBm)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
No Significant emissions within 20 dBm of the limit						Pass

Upper Conducted Band Edge



Date: 10.MAR.2026 15:25:19

16 Power spectral density

16.1 Definition

The power per unit bandwidth.

16.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2020, Clause 6.8
EUT Frequencies Measured:	903.0 MHz, 915.0 MHz & 927.5 MHz
EUT Channel Bandwidths:	500 kHz
Deviations From Standard:	None
Measurement BW:	3 kHz
Spectrum Analyzer Video BW: (requirement at least 3x RBW)	10 kHz
Measurement Span: (requirement 1.5 times Channel BW)	1.3 MHz
Measurement Detector:	Peak

Environmental Conditions (Normal Environment)

Temperature: 23 °C	+15 °C to +35 °C (as declared)
Humidity: 40 % RH	20 % RH to 75 % RH (as declared)
Supply: 6 Vdc	As declared

16.3 Test Limit

For equipment operating in the bands 902 - 928 MHz and 2400 - 2483.5 MHz the transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

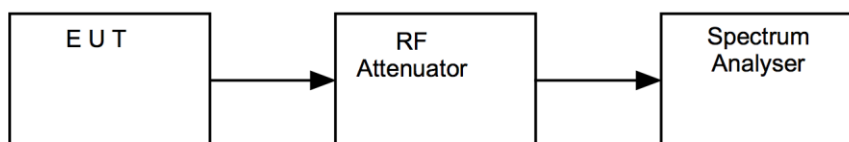
For equipment operating in the band 5725 - 5850 MHz the output power spectral density shall not exceed 30 dBm in any 500 kHz band

16.4 Test Method

With the EUT setup as per section 9 of this report and connected as per the test set-up diagram below, the peak emission of the EUT was measured on a spectrum analyser, with path losses taken into account.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst case configuration in each bandwidth.

Test Set-up Diagram

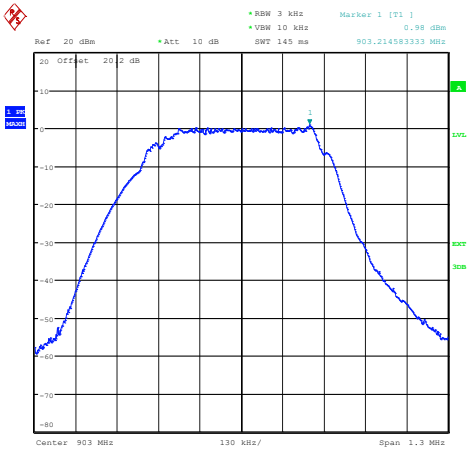


16.5 Test Equipment

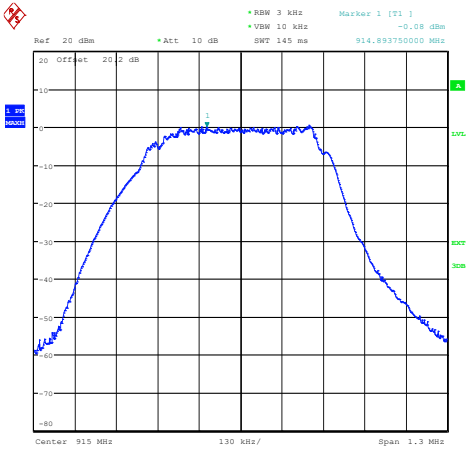
<i>Equipment Type</i>	<i>Manufacturer</i>	<i>Equipment Description</i>	<i>Element No</i>	<i>Due For Calibration</i>
FSU50	R&S	Spectrum Analyser	U544	2026-12-22
SMBV100A	R&S	Signal Generator	U674	2026-06-16
AS7836	AtlanTecRF	100W 20 dB Attenuator	U598	Cal in Use
IPS 303A	ISO-Tech	Power Supply	U747	Use REF976
34405a	Agilent	Multimeter	REF976	2027-02-16

16.6 Test Results

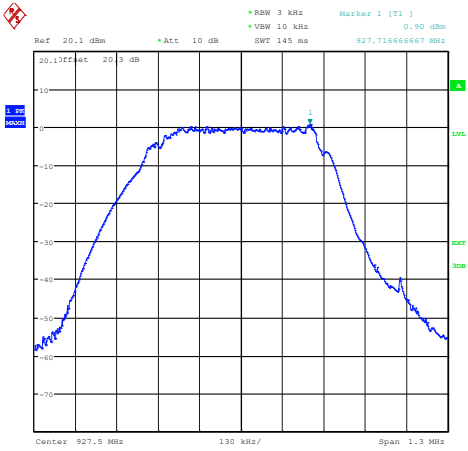
500 kHz Channel: Power Setting 14 dBm: Spreading Factor: SF7			
Channel Frequency (MHz)	Analyser Level (dBm)	PSD Limit (dBm)	Result
903.0	0.98	8.0	Pass
915.0	-0.08	8.0	Pass
927.5	0.90	8.0	Pass



903.0 MHz



915.0 MHz



927.5 MHz

17 Results Section FHSS Mode (B)

18 Radiated emissions

18.1 Definitions

Spurious emissions

Emissions on a frequency or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

Restricted bands

A frequency band in which intentional radiators are permitted to radiate only spurious emissions but not fundamental signals.

18.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	REF940
Test Standard and Clause:	ANSI C63.10-2020, Clause 6.5 and 6.6
EUT Frequencies Measured:	902.2 MHz, 908.5 MHz & 914.9 MHz
EUT Channel Bandwidths:	125 kHz
Deviations from Standard:	None
Measurement BW:	30 MHz to 1 GHz: 120 kHz; Above 1 GHz: 1 MHz
Measurement Detector:	Up to 1 GHz: quasi-peak; Above 1 GHz: RMS average and Peak

Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 °C to +35 °C (as declared)
Humidity: 36 % RH	20 %RH to 75 %RH (as declared)
Supply: 6 Vdc	As declared

18.3 Test Limit

Unwanted emissions that fall within the restricted frequency bands shall comply with the limits specified:

General Field Strength Limits for License-Exempt Transmitters at Frequencies above 30 MHz

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ at 3 m)	Field Strength (dB$\mu\text{V/m}$ at 3 m)
30 to 88	100	40.0
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

On frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function. On frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit.

18.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure i, the emissions from the EUT were measured on a spectrum analyzer / EMI receiver.

Radiated electromagnetic emissions from the EUT are checked first by preview scans. Preview scans for all spectrum and modulation characteristics are checked, using a peak detector and where applicable worst-case determined for function, operation, orientation, etc. for both vertical and horizontal polarisations. Pre-scan plots are shown with a peak detector and 100 kHz RBW.

If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in ANSI C63.10 are followed. Alternatively, a layout closest to normal use (as declared by the provider) is employed, (see EUT setup photographs for more detail).

Emissions between 30 MHz and 1 GHz are measured using calibrated broadband antennas. Emissions above 1 GHz are characterized using standard gain horn antennas. Pre-amplifiers and filters are used where required. Care is taken to ensure that test receiver resolution bandwidth, video bandwidth and detector type(s) meet the regulatory requirements.

For both horizontal and vertical polarizations, the EUT is then rotated through 360 degrees in azimuth until the highest emission is detected. At the previously determined azimuth the test antenna is raised and lowered from 1 to 4 m in height until a maximum emission level is detected, this maximum value is recorded.

Power values measured on the test receiver / analyzer are converted to field strength, FS, in dB μ V/m at the regulatory distance, using:

$$FS = PR + CL + AF - PA + DC - CF$$

$$\text{Factor} = CL + AF - PA$$

Where,

PR is the power recorded on the receiver / spectrum analyzer in dB μ V;

CL is the cable loss in dB;

AF is the test antenna factor in dB/m;

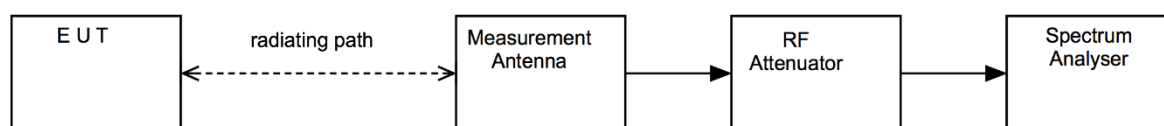
PA is the pre-amplifier gain in dB (where used);

DC is the duty correction factor in dB (where used, e.g. harmonics of pulsed fundamental);

CF is the distance factor in dB (where measurement distance different to limit distance);

This field strength value is then compared with the regulatory limit.

Figure i Test Setup

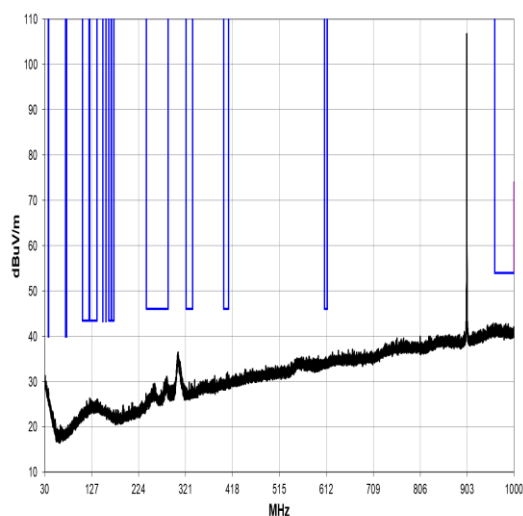


18.5 Test Equipment

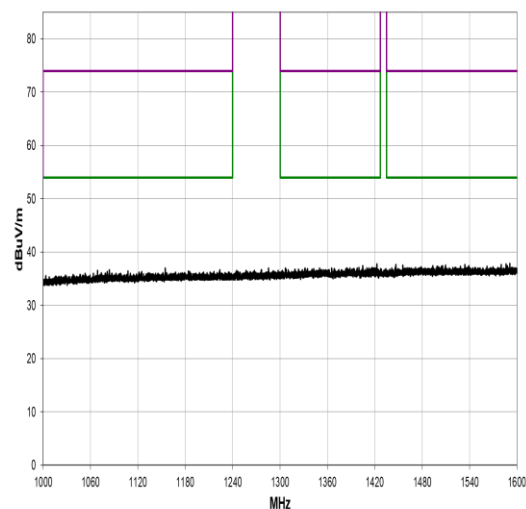
<i>Equipment Type</i>	<i>Manufacturer</i>	<i>Equipment Description</i>	<i>Element No</i>	<i>Due For Calibration</i>
Emissions R5	Element	Radiated Test Software	REF9000	Cal Not Required
ATS	Rainford EMC	Radio Chamber - PP	REF940	2028-01-19
ESR26	R&S	EMI Receiver	U489	2026-11-19
3115	EMCO	Horn Antenna	L138	2026-06-11
PAM-118A	COM-POWER	500 MHz -18 GHz Pre Amp	U1016	2026-06-20
VHF-3100+	MiniCircuits	3.1 GHz High Pass Filter	U718	2027-02-24
VHF-1500+	MiniCircuits	High Pass Filter	U519	2027-02-17
AFH-05000 Rev A	Atlantic Microwave	HI Pass Filter 5-16 GHz	U663	2027-02-12
CBL611/B	Chase	Bilog	U573	2026-11-04
LNA6901	AMETEK	Pre Amp	U711	2026-04-24

18.6 Test Results

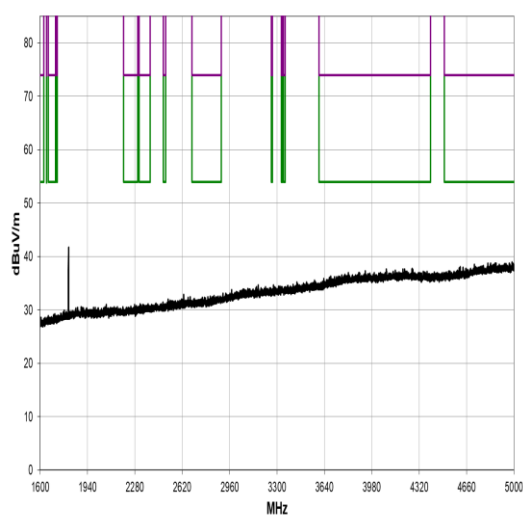
125 kHz LoRa; Bottom Channel; Frequency: 902.3 MHz; Power Setting: 14 dBm;
Spreading Factor: SF7; Coding Rate: 4/5, Mode: PA Boost; Interval: 400 ms; Payload: 16



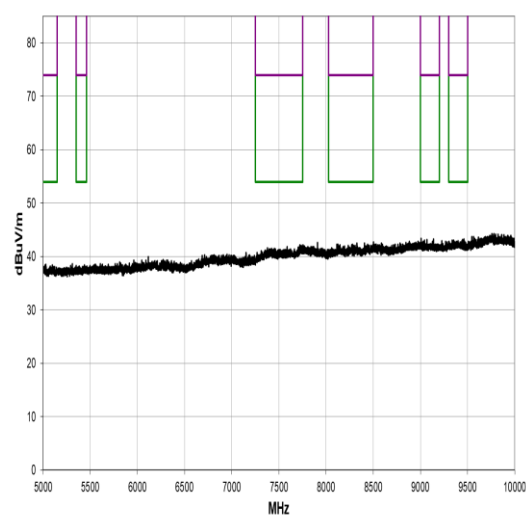
30 MHz to 1 GHz



1 GHz to 1.6 GHz



1.6 GHz to 5 GHz

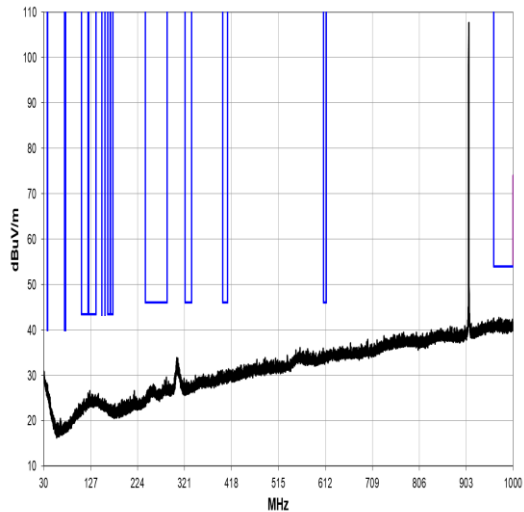


5 GHz to 10 GHz

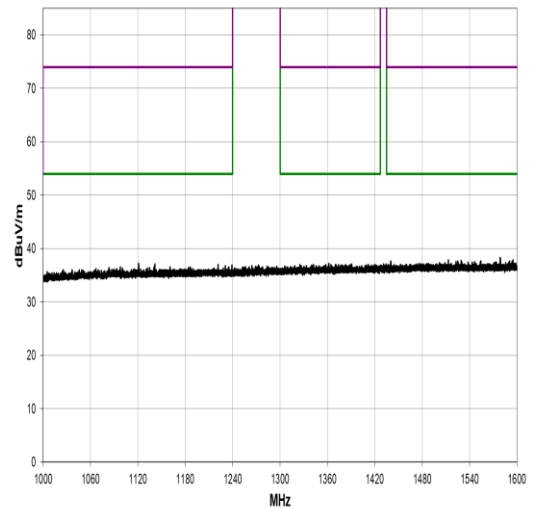
125 kHz LoRa, Bottom Channel; Frequency: 902.3 MHz; Power Setting: 14 dBm;
Spreading Factor: SF7; Coding Rate: 4/5; Mode: PA Boost; Interval: 400 ms; Payload: 16

Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Duty Cycle Corr'n (dB)	Distance Extrap'n Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No emissions within 20 dB of the limit								

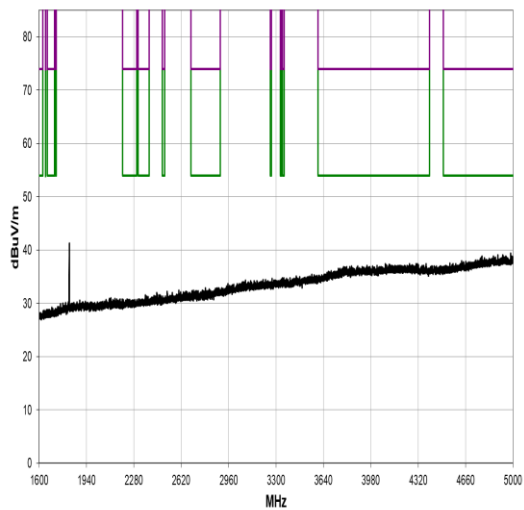
125 kHz LoRa; Middle Channel; Frequency: 908.5 MHz; Power Setting: 14 dBm;
 Spreading Factor: SF7; Coding Rate: 4/5; Mode: PA Boost; Interval: 400 ms; Payload: 16



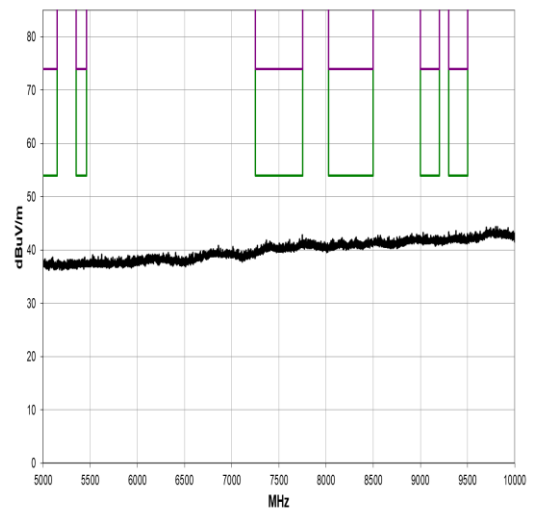
30 MHz to 1 GHz



1 GHz to 1.6 GHz



1.6 GHz to 5 GHz

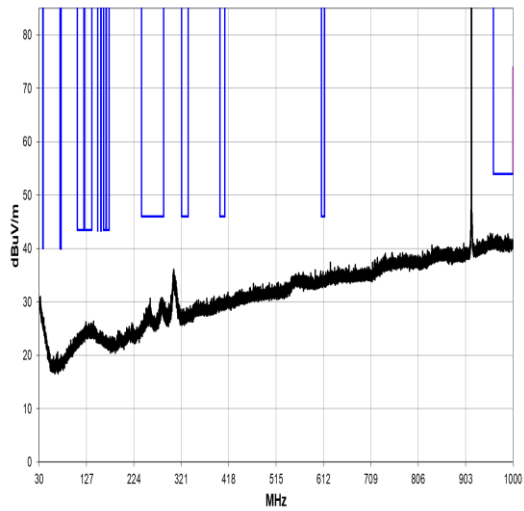


5 GHz to 10 GHz

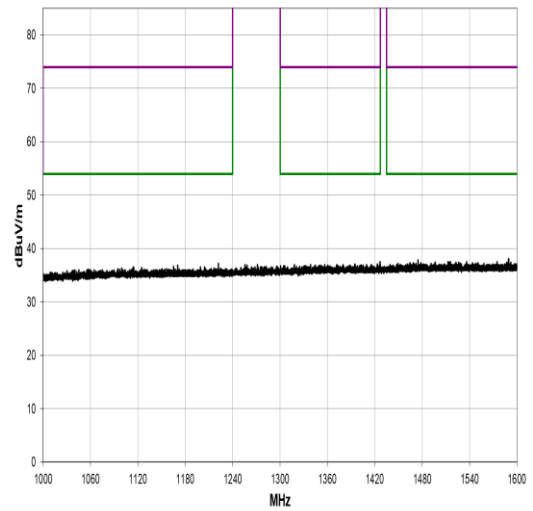
125 kHz LoRa; Middle Channel; Frequency: 908.5 MHz; Power Setting: 14 dBm;
 Spreading Factor: SF7; Coding Rate: 4/5; Mode: PA Boost; Interval: 400 ms; Payload: 16

Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Duty Cycle Corr'n (dB)	Distance Extrap'n Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No emissions within 20 dB of the limit								

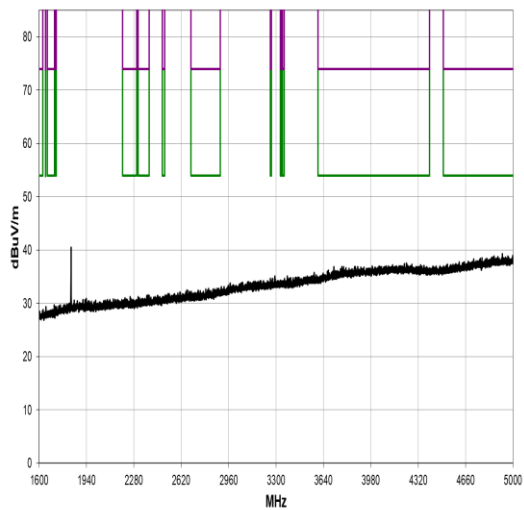
125 kHz LoRa; Top Channel; Frequency: 914.9 MHz; Power Setting: 14 dBm;
 Spreading Factor: SF7; Coding Rate: 4/5; Mode: PA Boost; Interval: 400 ms; Payload: 16



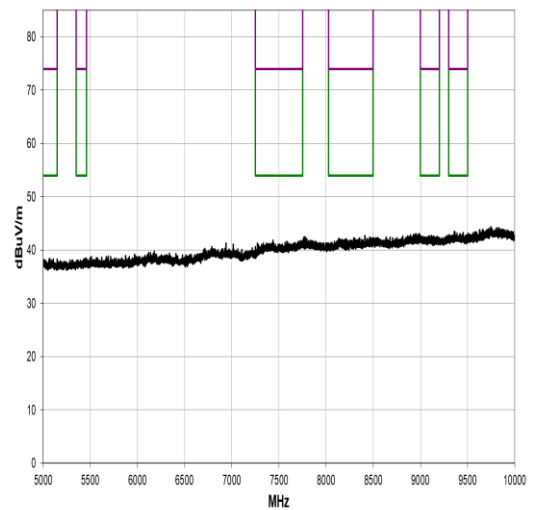
30 MHz to 1 GHz



1 GHz to 1.6 GHz



1.6 GHz to 5 GHz



5 GHz to 10 GHz

125 kHz LoRa; Top Channel; Frequency: 914.9 MHz; Power Setting: 14 dBm;
 Spreading Factor: SF7; Coding Rate: 4/5; Mode: PA Boost; Interval: 400 ms; Payload: 16

Detector	Freq. (MHz)	Meas'd Emission (dBμV)	Factor (dB)	Duty Cycle Corr'n (dB)	Distance Extrap'n Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No emissions within 20 dB of the limit								

19 Carrier frequency separation

19.1 Definition

The carrier frequency separation is the frequency separation between two adjacent hopping frequencies.

19.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2020, Clause 7.8.2
EUT Frequencies Measured:	All; 902 MHz - 928 MHz
EUT 20dB Bandwidth:	143 kHz
EUT Test Modulations:	Internal pattern generation – hopping enabled
Deviations From Standard:	None
Measurement BW:	20 kHz
Measurement Detector:	Peak

Environmental Conditions (Normal Environment)

Temperature: 23 °C	+15 °C to +35 °C (as declared)
Humidity: 40 % RH	20 % RH to 75 % RH (as declared)
Supply: 6 Vdc	As declared

19.3 Test Limit

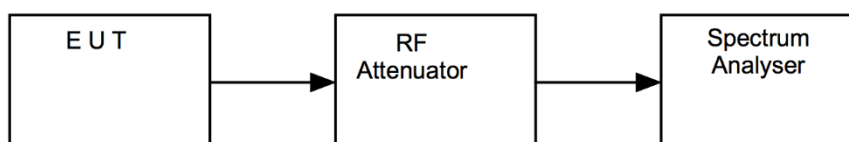
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the -20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the band 2400 to 2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the -20 dB bandwidth of the hopping channel, whichever is greater, provided that the systems operate with an output power no greater than 0.125 W.

19.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure iii, the emissions of the EUT were measured on a spectrum analyser.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst-case configuration in each nominal bandwidth.

Figure iii Test Setup



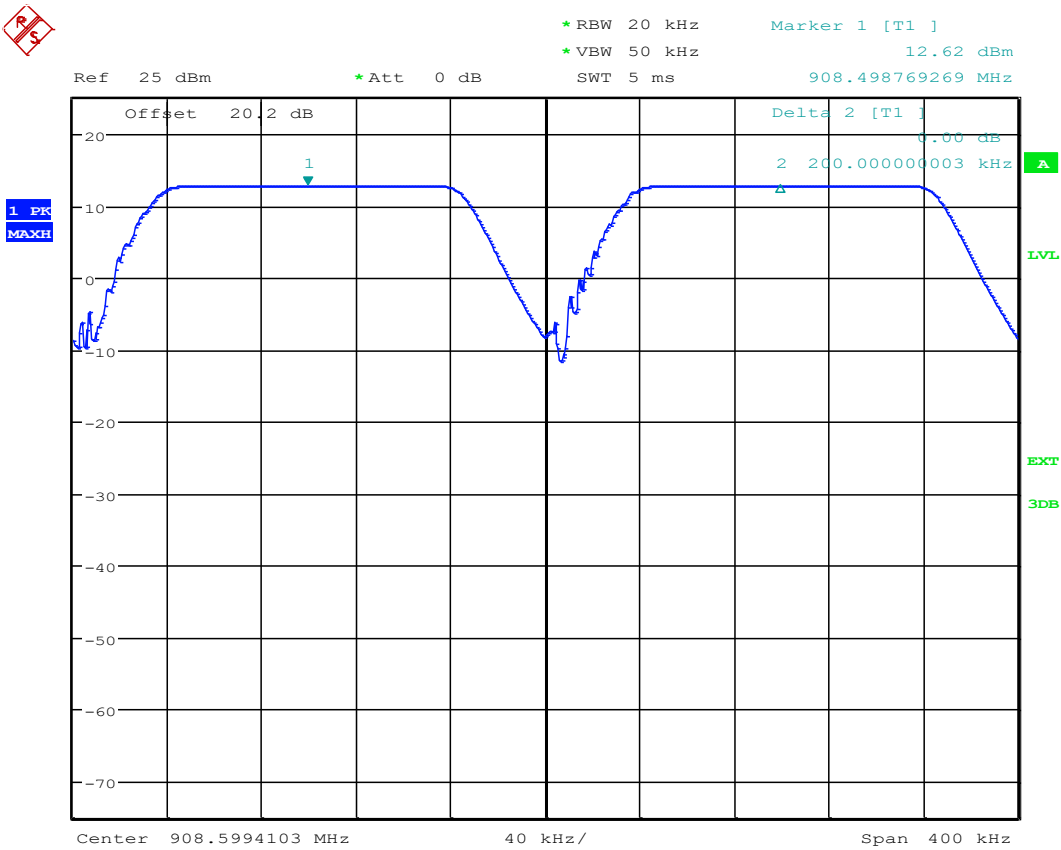
19.5 Test Equipment

<i>Equipment Type</i>	<i>Manufacturer</i>	<i>Equipment Description</i>	<i>Element No</i>	<i>Due For Calibration</i>
FSU50	R&S	Spectrum Analyser	U544	2026-12-22
SMBV100A	R&S	Signal Generator	U674	2026-06-16
AS7836	AtlanTecRF	100W 20 dB Attenuator	U598	Cal in Use
IPS 303A	ISO-Tech	Power Supply	U747	Use REF976
34405a	Agilent	Multimeter	REF976	2027-02-16

19.6 Test Results

Channel separation observed 64 hopping channels 125 kHz channel

Measured Channel Spacing (kHz)	Limit	Result
200.000000003	(25 kHz or the 20 Bandwidth kHz)	Pass



Date: 11.MAR.2026 12:17:44

20 Number of hopping frequencies

20.1 Definition

The total number of hopping frequencies (the center frequencies defined within the hopping sequence of a FHSS equipment) which are randomly sequenced in order to spread the transmission.

20.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2020, Clause 7.8.3
EUT Frequencies Measured:	All; 902 MHz - 928 MHz
EUT 20dB Bandwidth:	143 kHz
EUT Test Modulations:	Internal pattern generation – hopping enabled
Deviations From Standard:	None
Measurement BW:	20 kHz
Measurement Detector:	Peak

Environmental Conditions (Normal Environment)

Temperature: 23 °C	+15 °C to +35 °C (as declared)
Humidity: 40 %RH	20 %RH to 75 %RH (as declared)
Supply: 6 Vdc	As described

20.3 Test Limit

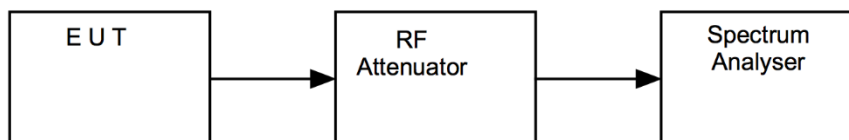
- For frequency hopping systems in the band 902 to 928 MHz: if the -20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels;
If the -20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping channels;
- Frequency hopping systems operating in the band 2400 to 2483.5 MHz shall use at least 15 hopping channels;
- Frequency hopping systems operating in the band 5725 to 5850 MHz shall use at least 75 hopping channels.

20.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure iv, the emissions of the EUT were measured on a spectrum analyser.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst-case configuration in each nominal bandwidth.

Figure iv Test Setup



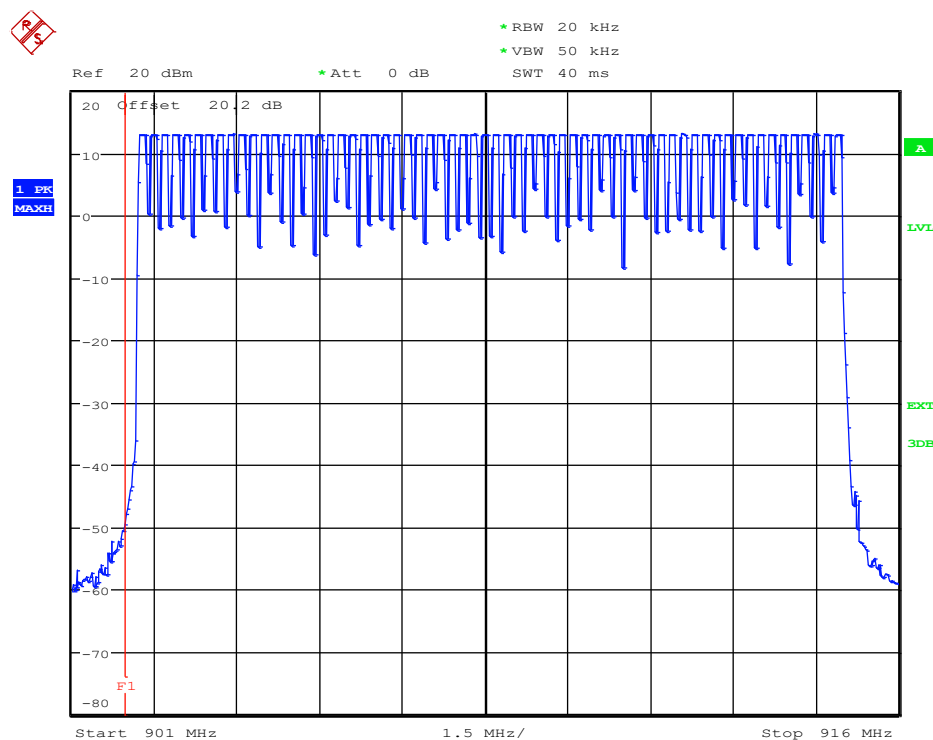
20.5 Test Equipment

Equipment Type	Manufacturer	Equipment Description	Element No	Due For Calibration
FSU50	R&S	Spectrum Analyser	U544	2026-12-22
SMBV100A	R&S	Signal Generator	U674	2026-06-16
AS7836	AtlanTecRF	100W 20 dB Attenuator	U598	Cal in Use
IPS 303A	ISO-Tech	Power Supply	U747	Use REF976
34405a	Agilent	Multimeter	REF976	2027-02-16

20.6 Test Results

125 kHz LoRa hopping mode: Transmit power setting 14 dBm: spreading factor SF7

64 Hopping channels observed



21 Average channel occupancy

21.1 Definition

The channel occupancy is the total of the transmitter 'on' times, during an observation period, on a particular hopping frequency.

21.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2020, Clause 7.8.4
Frequencies Measured:	908.5 MHz
EUT 20dB bandwidth:	140.384 kHz
EUT Number of hopping channels:	64
EUT Test Modulations:	Internal pattern generation – hopping enabled
Deviations From Standard:	None
Measurement BW:	100 kHz
Measurement Detector:	Peak

Environmental Conditions (Normal Environment)

Temperature: 23 °C	+15 °C to +35 °C (as declared)
Humidity: 40 % RH	20 % RH to 75 % RH (as declared)
Supply: 6 Vdc	As declared

21.3 Test Limit

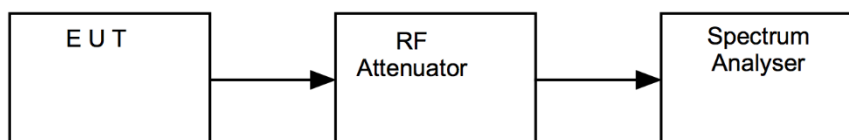
- For frequency hopping systems in the band 902 to 928 MHz: if the -20 dB bandwidth of the hopping channel is less than 250 kHz, the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 20 second period;
If the -20 dB bandwidth of the hopping channel is 250 kHz or greater, the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10 second period;
- Frequency hopping systems operating in the band 2400 to 2483.5 MHz: The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed;
- Frequency hopping systems operating in the band 5725 to 5850 MHz: The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

21.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure v, the emissions of the EUT were measured on a spectrum analyser.

The measurements were performed with EUT set at its maximum duty. A number of hops were observed to confirm consistency of the dwell time / observe the worst case. All modulation schemes, data rates and power settings were used to observe the worst-case configuration.

Figure v Test Setup



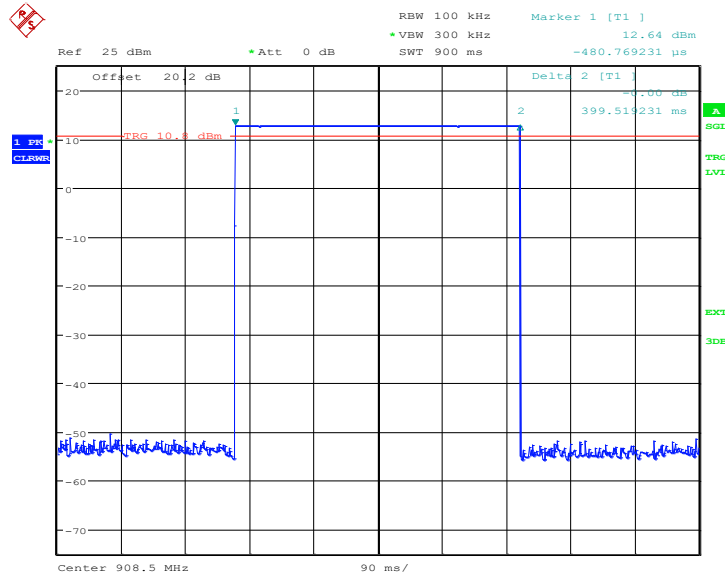
21.5 Test Equipment

<i>Equipment Type</i>	<i>Manufacturer</i>	<i>Equipment Description</i>	<i>Element No</i>	<i>Due For Calibration</i>
FSU50	R&S	Spectrum Analyser	U544	2026-12-22
SMBV100A	R&S	Signal Generator	U674	2026-06-16
RF Cable	Radiall	RF Cable 1.2 m N-N	U722	Cal in use
AS7836	AtlanTecRF	100W 20 dB Attenuator	U598	Cal in use
IPS 303A	ISO-Tech	Power Supply	U747	Use REF976
34405a	Agilent	Multimeter	REF976	2027-02-16

21.6 Test Results

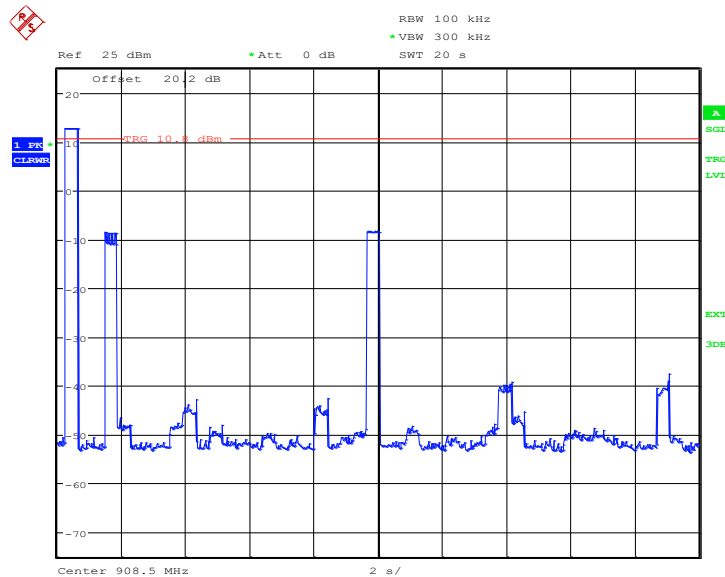
125 kHz LoRa; Power Setting 14 dBm; Spreading Factor: SF7					
<i>T_{occ}</i> (ms)	<i>MP</i> (s)	<i>MPTX</i>	<i>AOT</i> (S)	<i>Limit</i> (s)	<i>Result</i>
399.519231	20	1	0.399519231	0.4	Pass

Tx On Period



Date: 11.MAR.2026 13:23:51

Number of transmissions within the measurement period



Date: 11.MAR.2026 13:13:56

22 Maximum peak conducted output power

22.1 Definition

The maximum peak conducted output power is defined as the maximum power level measured with a peak detector using a filter with width and shape of which is sufficient to accept the signal bandwidth.

22.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2020, Clause 7.8.5
EUT Channels / Frequencies Measured:	902.3 MHz, 908.5 MHz & 914.9 MHz – hopping disabled.
EUT Channel Bandwidths:	125 kHz
Deviations From Standard:	None
Measurement BW:	200 kHz
Spectrum Analyzer Video BW:	1 MHz
Measurement Detector:	Peak
Voltage Extreme Environment Test Range:	Mains Power = 85 % and 115 % of Nominal (FCC only requirement) Battery Power = new battery.

Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 °C to +35 °C (as declared)
Humidity: 40 %RH	20 %RH to 75 %RH (as declared)

22.3 Test Limit

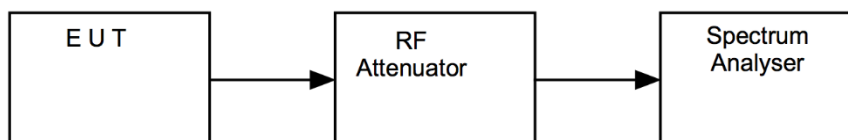
- For frequency hopping systems operating in the band 902 to 928 MHz, the maximum peak conducted output power shall not exceed 1 W, and the e.i.r.p. shall not exceed 4 W, if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W, and the e.i.r.p. shall not exceed 1 W, if the hopset uses less than 50 hopping channels.
- For frequency hopping systems operating in the band 2400 to 2483.5 MHz and employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1 W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125 W. The e.i.r.p. shall not exceed 4 W.
- For frequency hopping systems operating in the band 5725 to 5850 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W.
- Point-to-point systems in the bands 2400-2483.5 MHz and 5725 to 5850 MHz are permitted to have an e.i.r.p. higher than 4 W provided that the higher e.i.r.p. is achieved by employing higher gain directional antennas and not higher transmitter output powers.

22.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure vi, the resolution bandwidth of the spectrum analyser was increased above the EUT occupied bandwidth and the peak emission data noted.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst-case configuration in each bandwidth.

Figure vi Test Setup

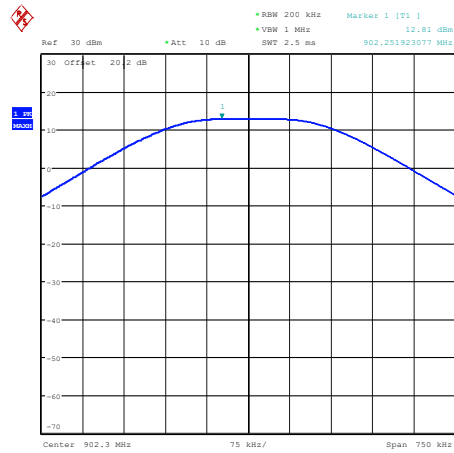


22.5 Test Equipment

<i>Equipment Type</i>	<i>Manufacturer</i>	<i>Equipment Description</i>	<i>Element No</i>	<i>Due For Calibration</i>
FSU50	R&S	Spectrum Analyser	U544	2026-12-22
SMBV100A	R&S	Signal Generator	U674	2026-06-16
AS7836	AtlanTecRF	100W 20 dB Attenuator	U598	Cal in Use
IPS 303A	ISO-Tech	Power Supply	U747	Use REF976
34405a	Agilent	Multimeter	REF976	2027-02-16

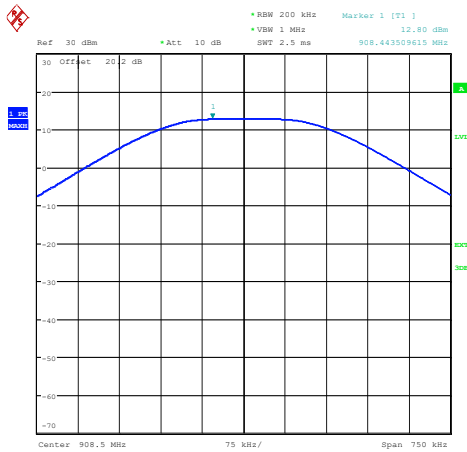
22.6 Test Results

125 kHz Operation – Hopping Stopped; Power Setting: 14 dBm; Spreading Factor: SF7			
Frequency (MHz)	Maximum peak conducted output power		Result
	(dBm)	(W)	
902.30	12.81	0.01909	Pass
908.50	12.80	0.01909	Pass
914.90	12.89	0.01945	Pass



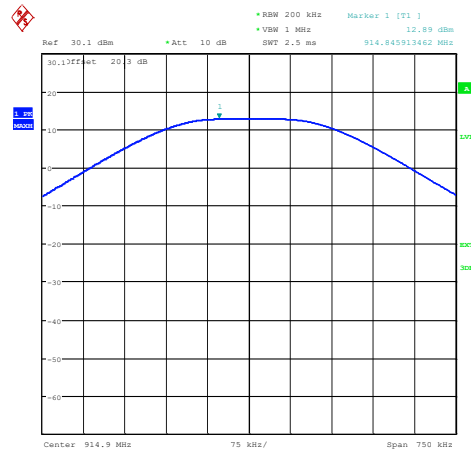
Date: 10.MAR.2026 11:43:34

902.3 MHz



Date: 10.MAR.2026 11:44:39

908.5 MHz



Date: 10.MAR.2026 11:45:45

914.9 MHz

23 Occupied Bandwidth

23.1 Definition

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal.

23.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2020, Clause 6.9
EUT Frequencies Measured:	902.3MHz, 908.50 MHz & 914.90 MHz – hopping stopped.
EUT Channel Bandwidths:	125 kHz
EUT Test Modulations:	SF7
Deviations From Standard:	None
Measurement BW: (requirement: 1 % to 5 % OBW)	3 kHz
Spectrum Analyzer Video BW: (requirement at least 3x RBW)	10 kHz
Measurement Span: (requirement 2 to 5 times OBW)	300 kHz
Measurement Detector:	Peak

Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 °C to +35 °C (as declared)
Humidity: 40 % RH	20 % RH to 75 % RH (as declared)
Supply: 6 Vdc	As declared

23.3 Test Limit

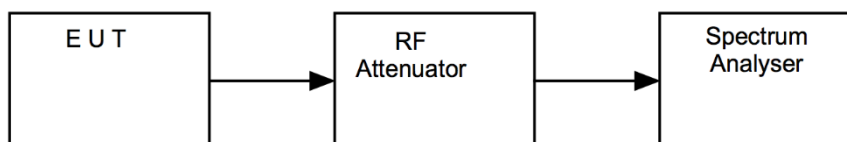
- For frequency hopping systems in the band 902 to 928 MHz: The maximum allowed -20 dB bandwidth of the hopping channel is 500 kHz.
- Frequency hopping systems operating in the band 5725 to 5850 MHz: The maximum -20 dB bandwidth of the hopping channel shall be 1 MHz

23.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure vii, the bandwidth of the EUT was measured on a spectrum analyser.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst-case configuration in each bandwidth.

Figure vii Test Setup

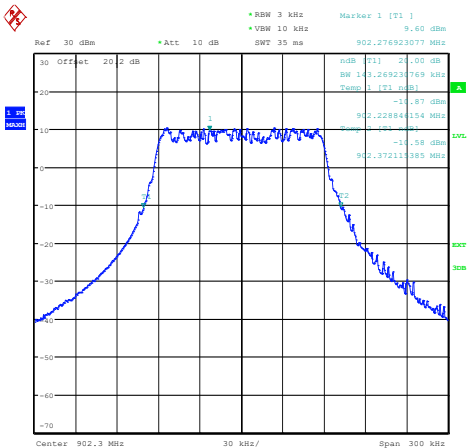


23.5 Test Equipment

<i>Equipment Type</i>	<i>Manufacturer</i>	<i>Equipment Description</i>	<i>Element No</i>	<i>Due For Calibration</i>
FSU50	R&S	Spectrum Analyser	U544	2026-12-22
SMBV100A	R&S	Signal Generator	U674	2026-06-16
AS7836	AtlanTecRF	100W 20 dB Attenuator	U598	Cal in Use
IPS 303A	ISO-Tech	Power Supply	U747	Use REF976
34405a	Agilent	Multimeter	REF976	2027-02-16

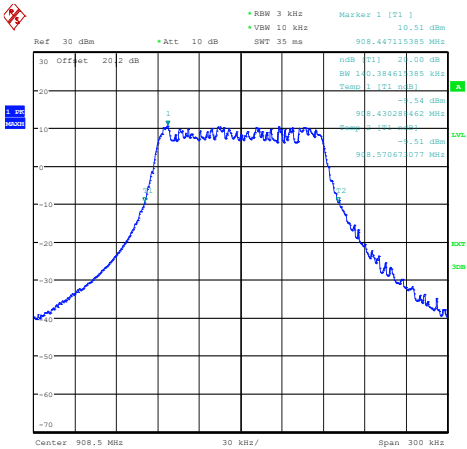
23.6 Test Results

20 dB Bandwidth 125 kHz; Operating Mode: Hopping Stopped				
Channel Frequency (MHz)	F_L (MHz)	F_H (MHz)	20dB Bandwidth (kHz)	Result
902.30	902.228846154	902.372115385	143.269	Pass
908.50	908.430288462	908.570673077	140.384	Pass
914.90	914.829807692	914.970673077	140.865	Pass



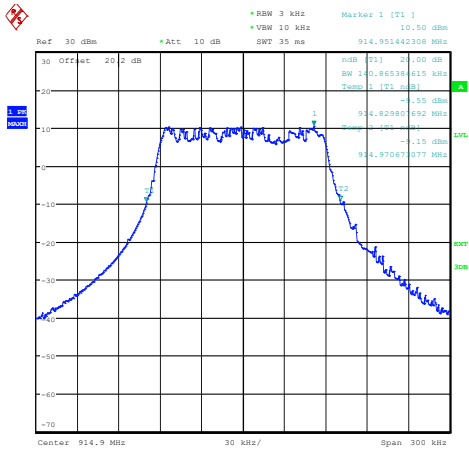
Date: 9.MAR.2026 17:19:10

902.3 MHz



Date: 9.MAR.2026 17:26:51

908.5 MHz



Date: 9.MAR.2026 17:22:03

914.9 MHz

24 Out-of-band and conducted spurious emissions

24.1 Definition

Out-of-band emission.

Emission on a frequency or frequencies immediately outside the necessary bandwidth that results from the modulation process but excluding spurious emissions.

Spurious emission.

Emission on a frequency or frequencies that are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products, and frequency conversion products, but exclude out-of-band emissions.

24.2 Test Parameters

Test Location:	Element Skelmersdale
Test Chamber:	Radio Laboratory
Test Standard and Clause:	ANSI C63.10-2020, Clause 7.8.8
EUT Frequencies Measured:	902.3 MHz, 908.5 MHz & 914.9 MHz
EUT Channel Bandwidths:	125 kHz
Deviations From Standard:	None
Measurement BW:	100 kHz
Spectrum Analyzer Video BW: (requirement at least 3x RBW)	300 kHz
Measurement Detector:	Peak
Measurement Range:	9 kHz to 10 GHz

Environmental Conditions (Normal Environment)

Temperature: 23 °C	+15 °C to +35 °C (as declared)
Humidity: 40 % RH	20 % RH to 75 % RH (as declared)
Supply: 6 Vdc	As declared

24.3 Test Limits

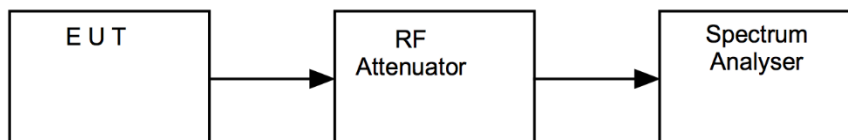
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in FCC 47CFR15.209(a) / RSS-Gen is not required.

24.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure viii, the emissions from the EUT were measured on a spectrum analyser.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst case configuration in each bandwidth.

Figure viii Test Setup

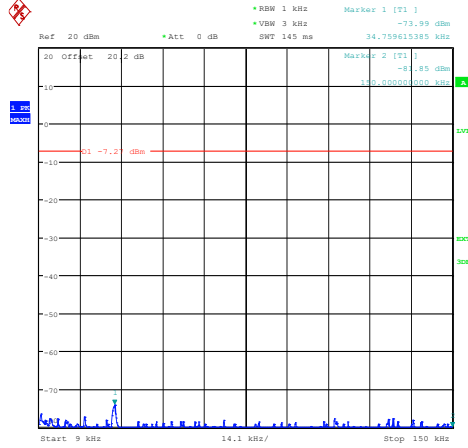


24.5 Test Equipment

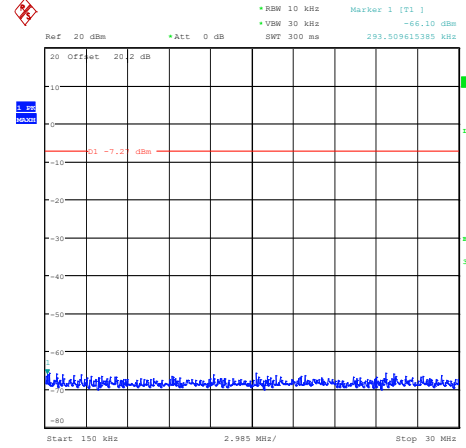
<i>Equipment Type</i>	<i>Manufacturer</i>	<i>Equipment Description</i>	<i>Element No</i>	<i>Due For Calibration</i>
FSU50	R&S	Spectrum Analyser	U544	2026-12-22
SMBV100A	R&S	Signal Generator	U674	2026-06-16
AS7836	AtlanTecRF	100W 20 dB Attenuator	U598	Cal in Use
IPS 303A	ISO-Tech	Power Supply	U747	Use REF976
34405a	Agilent	Multimeter	REF976	2027-02-16

24.6 Test Results

125 kHz Channel; Frequency: 902.3 MHz; Power Setting: 14 dBm; Spreading Factor: SF7

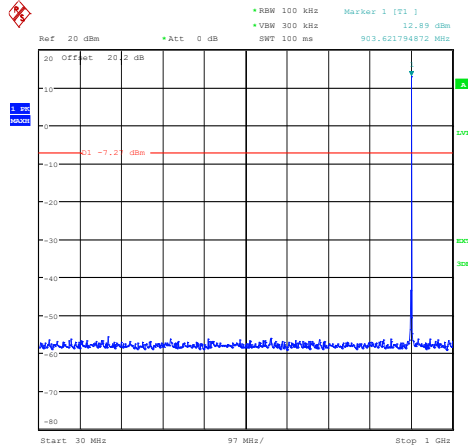


Date: 10.MAR.2026 16:21:05



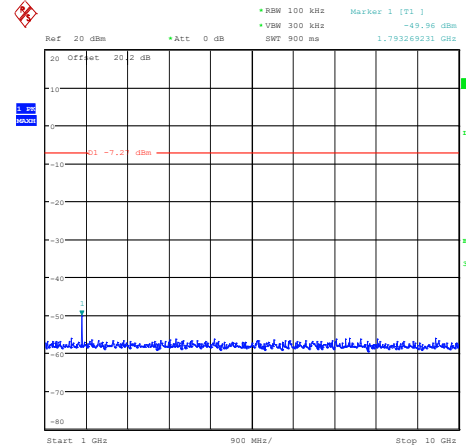
Date: 10.MAR.2026 16:21:52

9 kHz to 150 kHz



Date: 10.MAR.2026 16:22:25

150 kHz to 30 MHz



Date: 10.MAR.2026 16:22:48

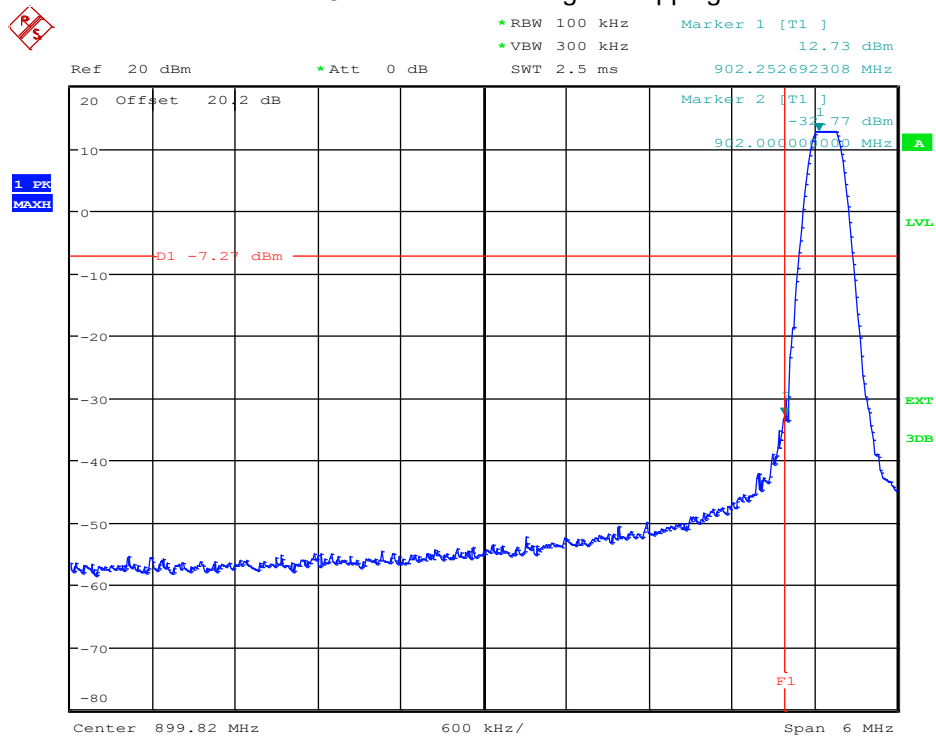
30 MHz to 1 GHz

1 GHz to 10 GHz

125 kHz Channel; Frequency: 902.3 MHz; Power Setting: 14 dBm; Spreading Factor: SF7

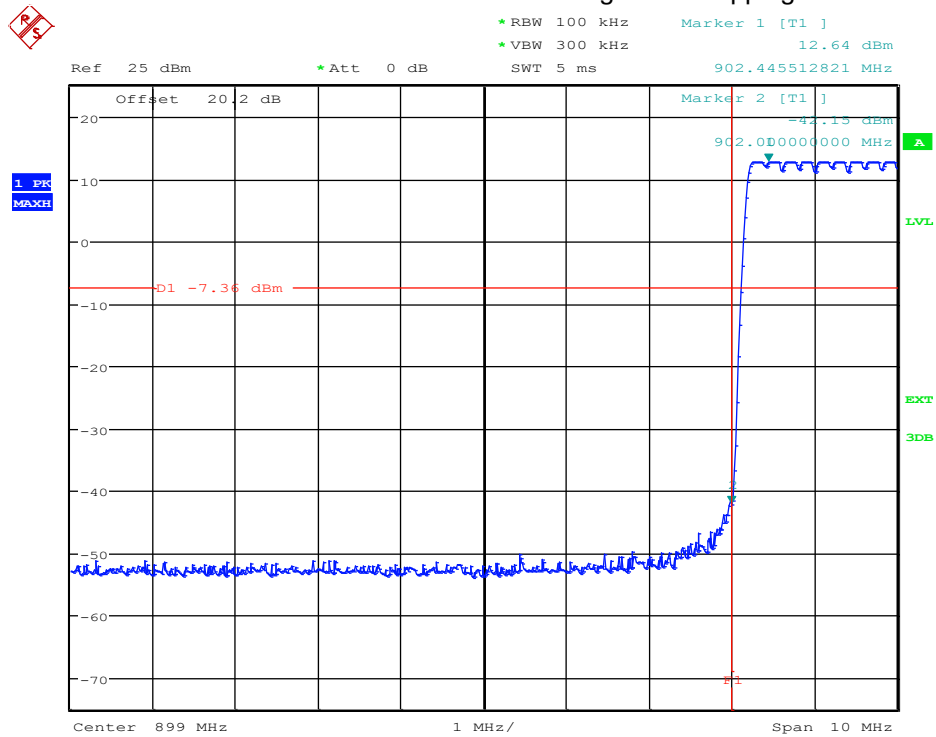
Channel Frequency (MHz)	Emission Frequency (MHz)	Analyzer Level (dBm)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
No significant emissions within 20 dB of the limit						Pass

Lower Conducted Band Edge – Hopping Disabled



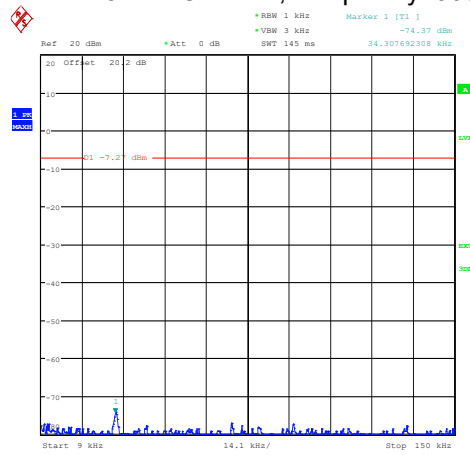
Date: 10.MAR.2026 16:20:29

Lower Conducted Band Edge – All Hopping

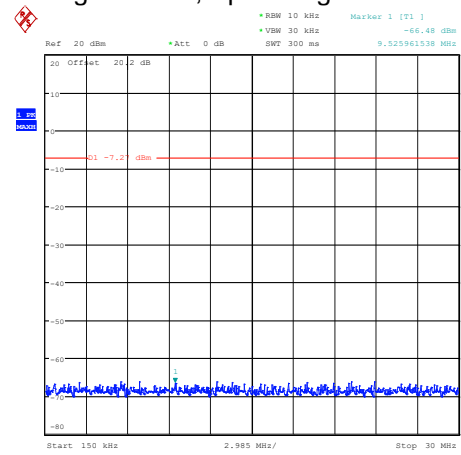


Date: 11.MAR.2026 12:47:08

125 kHz Channel; Frequency: 908.5 MHz; Power Setting: 14 dBm; Spreading Factor: SF7

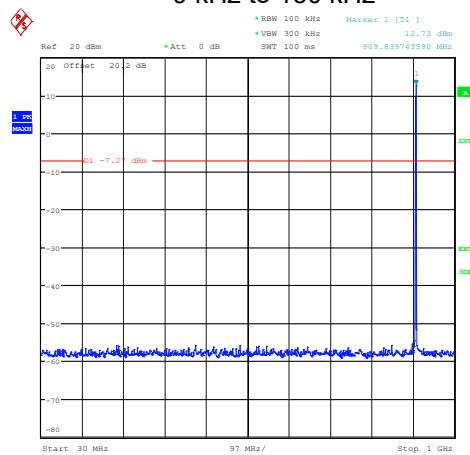


Date: 10.MAR.2026 16:27:55



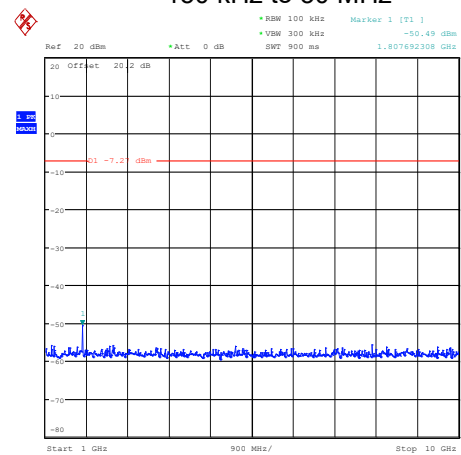
Date: 10.MAR.2026 16:28:32

9 kHz to 150 kHz



Date: 10.MAR.2026 16:29:00

150 kHz to 30 MHz



Date: 10.MAR.2026 16:29:20

30 MHz to 1 GHz

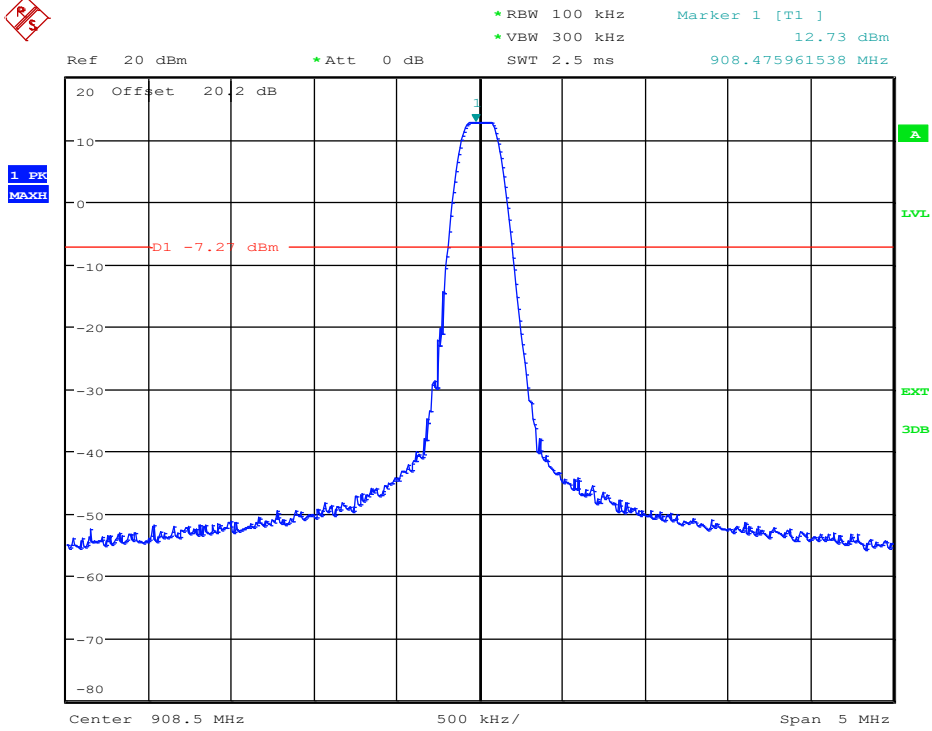
1 GHz to 10 GHz

125 kHz Channel; Frequency: 908.5 MHz; Power Setting: 14 dBm; Spreading Factor: SF7

Channel Frequency (MHz)	Emission Frequency (MHz)	Analyzer Level (dBm)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
No significant emissions within 20 dB of the limit						Pass

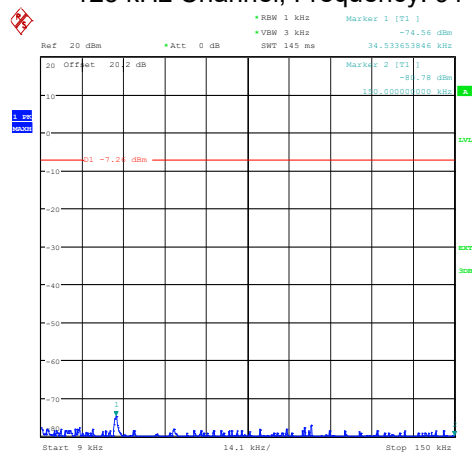


Middle Channel Limit Reference Plot

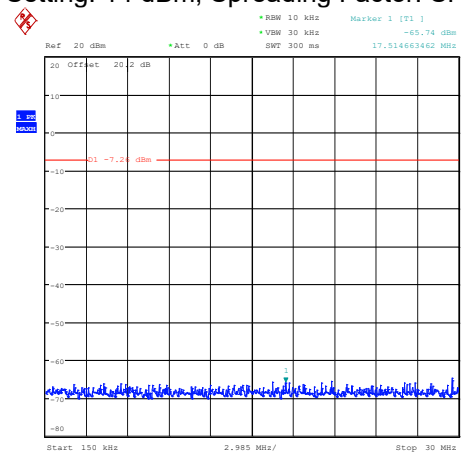


Date: 10.MAR.2026 16:27:10

125 kHz Channel; Frequency: 914.9 MHz; Power Setting: 14 dBm; Spreading Factor: SF7

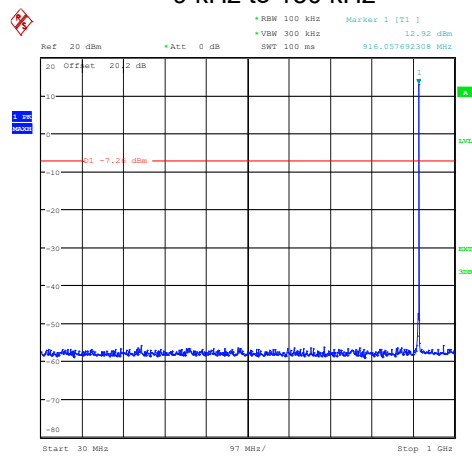


Date: 10.MAR.2026 16:40:16



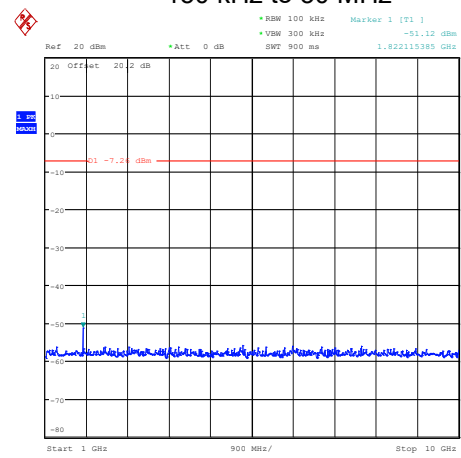
Date: 10.MAR.2026 16:40:56

9 kHz to 150 kHz



Date: 10.MAR.2026 16:41:31

150 kHz to 30 MHz



Date: 10.MAR.2026 16:41:57

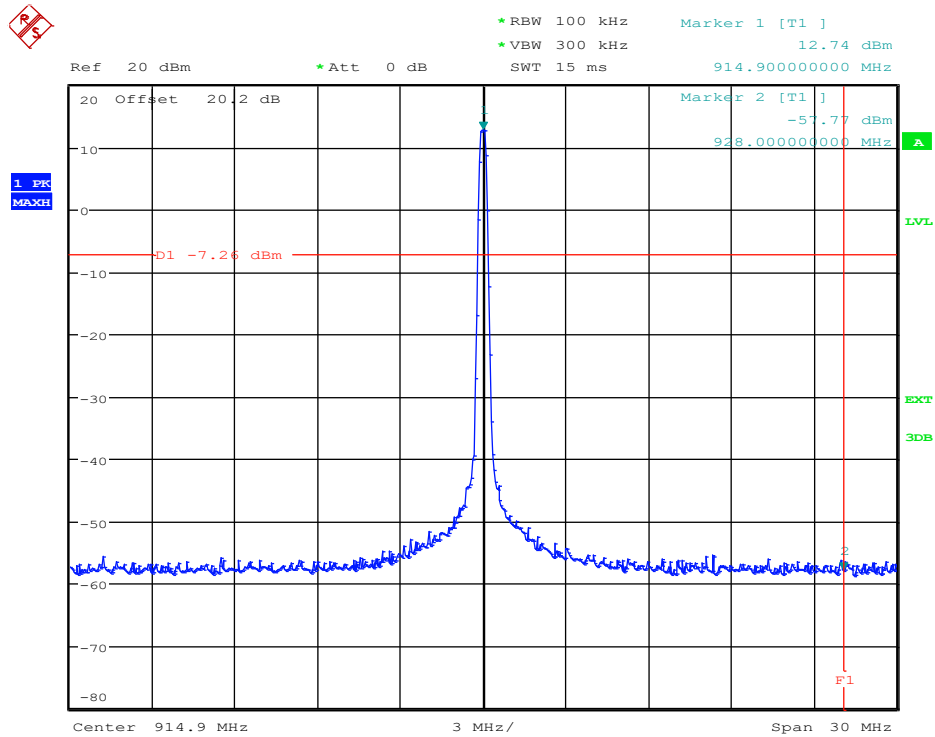
30 MHz to 1 GHz

1 GHz to 10 GHz

125 kHz Channel; Frequency: 914.9 MHz; Power Setting: 14 dBm; Spreading Factor: SF7

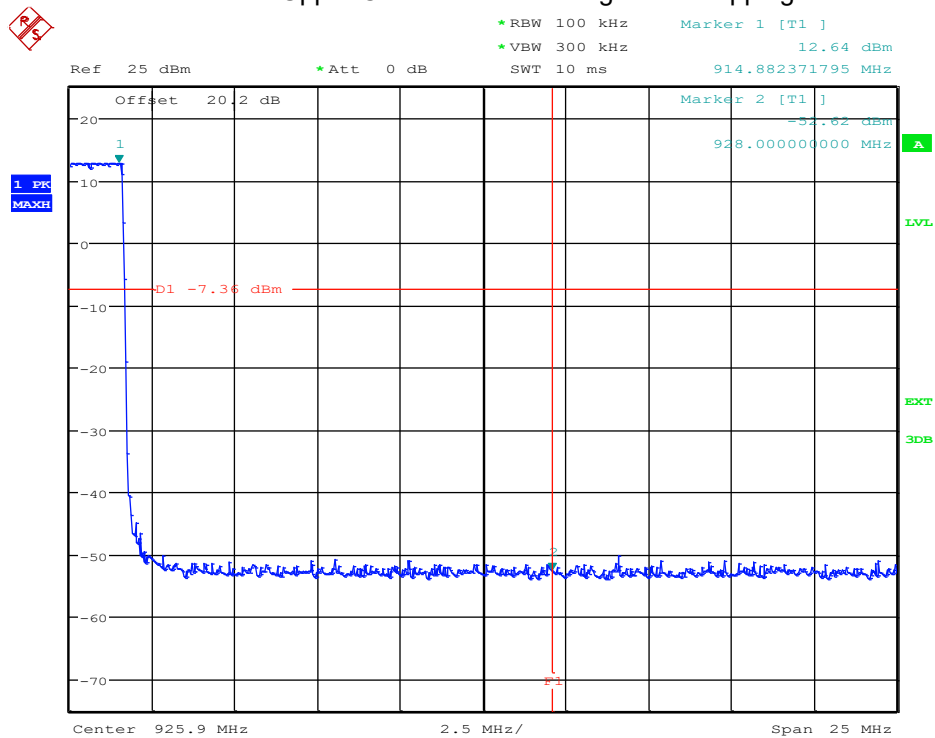
Channel Frequency (MHz)	Emission Frequency (MHz)	Analyzer Level (dBm)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
No significant emissions within 20 dB of the limit						Pass

Upper Conducted Band Edge – Hopping Disabled



Date: 10.MAR.2026 16:39:19

Upper Conducted Band Edge – All Hopping



Date: 11.MAR.2026 12:52:55

25 Measurement Uncertainty

Radio Testing – General Uncertainty Schedule

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95 % confidence where no required test level exists.

Test/Measurement	Budget Number	MU
Conducted RF Power, Power Spectral Density, Adjacent Channel Power and Spurious emissions		
Absolute RF power (via antenna connector) Sampling Power Meter to 8 GHz	MU4001	0.9 dB
Carrier Power and PSD - Spectrum Analysers	MU4004	1.7 dB
Adjacent Channel Power	MU4002	1.9 dB
Transmitter conducted spurious emissions (Including emissions due to intermodulation)	MU4041	0.9 dB
Conducted power and spurious emissions 40 GHz to 50 GHz	MU4042	2.4 dB
Conducted power and spurious emissions 50 GHz to 75 GHz	MU4043	2.5 dB
Conducted power and spurious emissions 75 GHz to 110 GHz	MU4044	2.4 dB
Radiated RF Power and Spurious emissions ERP and EIRP		
Effective Radiated Power Reverb Chamber	MU4020	3.7 dB
Effective Radiated Power	MU4021	4.7 dB
TRP Emissions 30 MHz to 1 GHz using CBL6111 or CBL6112 Bilog Antenna	MU4046	5.3 dB
TRP Emissions 1 GHz to 18 GHz using HL050 Log Periodic Antenna	MU4047	5.1 dB
TRP Emissions 18 GHz to 26.5 GHz using Standard Gain Horn	MU4048	2.7 dB
TRP Emissions 26.5 GHz to 40 GHz using Standard Gain Horn	MU4049	2.7 dB
In-band (3450-3980 MHz) TRP using CATR_ASH_B2	MU4051	4.1 dB
Cellular Radiated Spurious Emissions in a SAC 30 MHz to 180 MHz	MU4052	6.3 dB
Cellular Radiated Spurious Emissions in a SAC 180 MHz to 18 GHz	MU4052	3.6 dB
Cellular Radiated Spurious Emissions in a FAR 30 MHz to 180 MHz	MU4052	5.4 dB
Cellular Radiated Spurious Emissions in a FAR 180 MHz to 18 GHz	MU4052	3.0 dB
Spurious Emissions Electric and Magnetic Field		
Radiated Spurious Emissions 30 MHz to 1 GHz (Including emissions due to intermodulation)	MU4037	4.7 dB
Radiated Spurious Emissions 1-18 GHz (Including emissions due to intermodulation)	MU4032	4.5 dB
E Field Emissions 18 GHz to 26 GHz	MU4024	3.2 dB
E Field Emissions 26 GHz to 40 GHz	MU4025	3.3 dB
E Field Emissions 40 GHz to 50 GHz	MU4026	3.5 dB
E Field Emissions 50 GHz to 75 GHz	MU4027	3.6 dB
E Field Emissions 75 GHz to 110 GHz	MU4028	3.6 dB
Radiated Magnetic Field Emissions	MU4031	2.3 dB

Test/Measurement	Budget Number	MU
Frequency Measurements		
Frequency Deviation	MU4022	3.7 kHz
Frequency error using CMTA test set	MU4023	113.441 Hz
Frequency error using GPS locked frequency source	MU4045	0.0413 ppm
Bandwidth/Spectral Mask Measurements		
Channel Bandwidth	MU4005	3.87%
Transmitter Mask Amplitude	MU4039	1.3 dB
Transmitter Mask Frequency	MU4040	2.59%
Time Domain Measurements		
Transmission Time	MU4038	4.40%
Dynamic Frequency Selection (DFS) Parameters		
DFS Analyser - Measurement Time	MU4006	678.984 μ s
DFS Generator - Frequency Error	MU4007	91.650 Hz
DFS Threshold Conducted	MU4008	1.3 dB
DFS Threshold Radiated	MU4009	3.2 dB
Receiver Parameters		
EN 300 328 Receiver Blocking	MU4010	1.1 dB
EN 301 893 Receiver Blocking	MU4011	1.1 dB
EN 303 340 Adjacent Channel Selectivity	MU4012	1.1 dB
EN 303 340 Overloading	MU4013	1.1 dB
EN 303 340 Receiver Blocking	MU4014	1.1 dB
EN 303 340 Receiver Sensitivity	MU4015	0.9 dB
EN 303 372-1 Image Rejection	MU4016	1.4 dB
EN 303 372-1 Receiver Blocking	MU4017	1.1 dB
EN 303 372-2 Adjacent Channel Selectivity	MU4018	1.1 dB
EN 303 372-2 Dynamic Range	MU4019	0.9 dB
Receiver Blocking Talk Mode Conducted	MU4033	1.2 dB
Receiver Blocking Talk Mode- radiated	MU4034	3.4 dB
Rx Blocking, listen mode, blocking level	MU4035	3.2 dB
Rx Blocking, listen mode, radiated Threshold Measurement	MU4036	3.4 dB
Adjacent Sub Band Selectivity	MU4003	4.2 dB

Test/Measurement	Budget Number	MU
Rohde & Schwarz TS8997		
Carrier frequency	MU4050	5.2 ppm
RF Output Power	MU4050	1.0 dB
Peak Power	MU4050	0.8 dB
Power Spectral Density	MU4050	1.0 dB
Occupied Channel Bandwidth	MU4050	2.08 %
Transmitter unwanted emissions in-band	MU4050	0.9 dB
Transmitter unwanted emissions in the spurious domain 30 MHz to 1 GHz	MU4050	0.6 dB
Transmitter unwanted emissions in the spurious domain 1 GHz to 12.75 GHz	MU4050	1.8 dB
Receiver Spurious emission 30 MHz to 1 GHz	MU4050	0.6 dB
Receiver Spurious emission 1 GHz to 12.75 GHz	MU4050	1.8 dB
Duty Cycle	MU4050	0.02 %
Tx Sequence	MU4050	0.02 %
Tx Gap	MU4050	0.02 %
Medium Utilisation	MU4050	0.1 %
Accumulated Transmit Time	MU4050	0.01 %
Minimum Frequency Occupation Time	MU4050	0.01 %
Hopping Frequency Separation	MU4050	0.6 %
Receiver blocking (for bit streams)	MU4050	3.0 dB
Channel Access Mechanism / Adaptivity / DFS / Contention Based Protocol	MU4050	1.8 dB