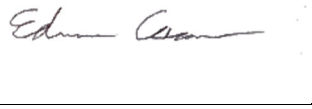
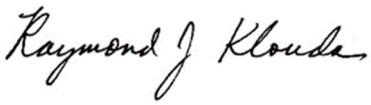
Engineering Test Report No. 2502504-01		
Report Date	December 8, 2025	
Manufacturer Name	Fastenal Company	
Manufacturer Address	2001 Theurer Blvd Winona, MN 55987	
Product Name Model No.	LoRa Module RN2903A	
Date Received	December 2, 2025	
Test Dates	December 2, 2025 – December 4, 2025	
Specifications	FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 Innovation, Science, and Economic Development Canada, RSS-GEN Innovation, Science, and Economic Development Canada, RSS-247	
Test Facility	Elite Electronic Engineering, Inc. 1516 Centre Circle, Downers Grove, IL 60515	FCC Reg. Number: 269750 IC Reg. Number: 2987A CAB Identifier: US0107
Signature		
Tested by	Edwin Casas	
Signature		
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894	
PO Number	01N9961-111425-1419	

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, RSS-247 test specifications. The data presented in this test report pertains to the EUT on the test dates specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification. This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

Table of Contents

1. Report Revision History

Revision	Date	Description
–	9 DEC 2025	Initial Release of Engineering Test Report No. 2502504-01

2. Introduction

2.1. Scope of Tests

This document presents the results of a series of RF emissions tests that were performed on the Fastenal Company LoRa Module (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was manufactured and submitted for testing by Fastenal Company located in Winona, MN.

2.2. Purpose

The test series was performed to determine if the EUT meets the RF emission requirements of the FCC “Code of Federal Regulations” Title 47, Part 15, Subpart C, §15.247 for a Digital Modulation intentional radiator operating within the 902 – 928MHz band.

The test series was also performed to determine if the EUT meets the RF emission requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification RSS-Gen and Innovation, Science, and Economic Development Canada Radio Standards Specification RSS-247 for a Digital Modulation intentional radiator operating within the 902 – 928MHz band.

Testing was performed in accordance with ANSI C63.10-2013.

2.3. Identification of the EUT

The EUT was identified as follows:

EUT Identification	
EUT Description	LoRa Module
Model/Part No.	RN2903A
Serial No.	N/A
Size of EUT	17.8 x 26.7 x 3.34 mm
Software/Firmware Version	1.0.3
Device Type	Digitally Modulated Transmission Device
Band of Operation	902 – 928MHz
Modulation Type	LoRa
Antenna Type	PCB
Conducted Output Power	18.5dBm
6dB Bandwidth	731.30kHz
Occupied Bandwidth (99% CBW)	640kHz

3. Power Input

The EUT obtained 5VDC power via a USB connection to the support laptop. The laptop obtained power through an AC/DC adapter powered at 120V 60Hz.

4. Grounding

The EUT was not connected to ground.

5. Support Equipment

The EUT was submitted for testing along with the following support equipment:

Description	Model #	S/N
Laptop	Latitude E5540	---

6. Interconnect Leads

The following interconnect cables were submitted with the EUT:

Item	Description
USB	Connects laptop to EUT

7. Modifications Made to the EUT

No modifications were made to the EUT during the testing.

8. Modes of Operation

The EUT and all peripheral equipment were energized. The EUT was programmed to transmit in one of the following modes:

Mode	Description
Tx On	Power Setting = 18dBm
Tx Off	Transmitter in standby mode.

9. Test Specifications

The tests were performed to selected portions of, and in accordance with, the test specifications.

- Federal Communications Commission "Code of Federal Regulations", Title 47, Chapter I, Subchapter A, Part 15, Subpart C
- 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 9kHz to 40GHz”
- ANSI C63.10-2020+Cor. 1:2023+C63.10a:2024, “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”
- Federal Communications Commission Office of Engineering and Technology Laboratory Division, Guidance For Compliance Measurements On Digital Transmission Systems, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.247 April 2, 2019 KDB 558074 D01v05r02
- RSS-Gen Issue 5, February 2021, Amendment 2, Innovation, Science, and Economic Development Canada, “General Requirements for Compliance of Radio Apparatus”
- RSS-247 Issue 4, July 2025, “Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices”

10. Test Plan

No test plan was provided. Instructions were provided by personnel from Fastenal Company and used in conjunction with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247, Innovation, Science, and Economic Development Canada, RSS-247, and ANSI C63.4-2014 specifications.

11. Deviation, Additions to, or Exclusions from Test Specifications

There were no deviations, additions to, or exclusions from the test specifications during this test series.

12. Laboratory Conditions

The ambient parameters of the laboratory during testing were as follows:

Ambient Parameters	Value
Temperature	23.6°C
Relative Humidity	22%
Atmospheric Pressure	1010.2mb

13. Summary

The following EMC tests were performed and the results are shown below:

Test Description	Requirements	Test Method	Results
Transmitter Conducted Emissions (AC Mains)	FCC 15.207 ISED RSS-GEN	ANSI C63.10:2020	Conforms
6dB Bandwidth	FCC 15.247 ISED RSS-247	ANSI C63.10:2020	Conforms
Occupied Bandwidth (99%)	FCC 15.247 ISED RSS-247	ANSI C63.10:2020	Conforms
Maximum Peak Conducted Output Power	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Conforms
Effective Isotropic Radiated Power (EIRP)	FCC 15.247 ISED RSS-247	ANSI C63.10:2020	Conforms
Spurious Radiated Emissions	FCC 15.247 ISED RSS-247	ANSI C63.10:2020	Conforms
Band-Edge Compliance	FCC 15.247 ISED RSS-247	ANSI C63.10:2020	Conforms
Power Spectral Density	FCC 15.247 ISED RSS-247	ANSI C63.10:2020	Conforms

14. Sample Calculations

For Powerline Conducted Emissions:

The resultant voltage level (VL) is a summation in decibels (dB) of the receiver meter reading (MTR) and the cable loss factor (CF).

Formula 1: VL (dBµV) = MTR (dBµV) + CF (dB).

For Radiated Emissions:

The resultant field strength (FS) is a summation in decibels (dB) of the receiver meter reading (MTR), the antenna correction factor (AF), and the cable loss factor (CF). If an external preamplifier is used, the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total.

Formula 1: FS (dBµV/m) = MTR (dBµV) + AF (dB/m) + CF (dB) + (- PA (dB)) + DC (dB)

To convert the Field Strength dBµV/m term to µV/m, the dBµV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in µV/m terms.

Formula 2: FS (µV/m) = AntiLog [(FS (dBµV/m))/20]

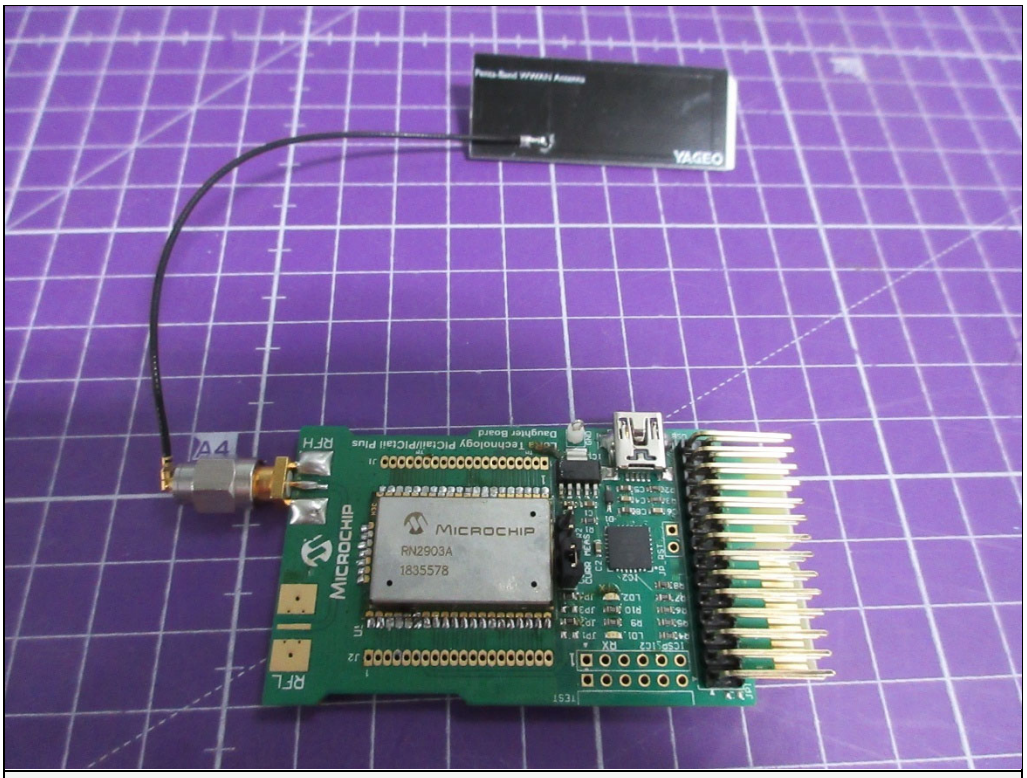
15. Statement of Conformity

The Fastenal Company LoRa Module (Model No. RN2903A, Serial No. N/A) did fully conform to the selected requirements of FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, RSS-247.

16. Certification

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, RSS-247 test specifications. The data presented in this test report pertains to the EUT as received by the customer on the test date specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

17. Photographs of EUT

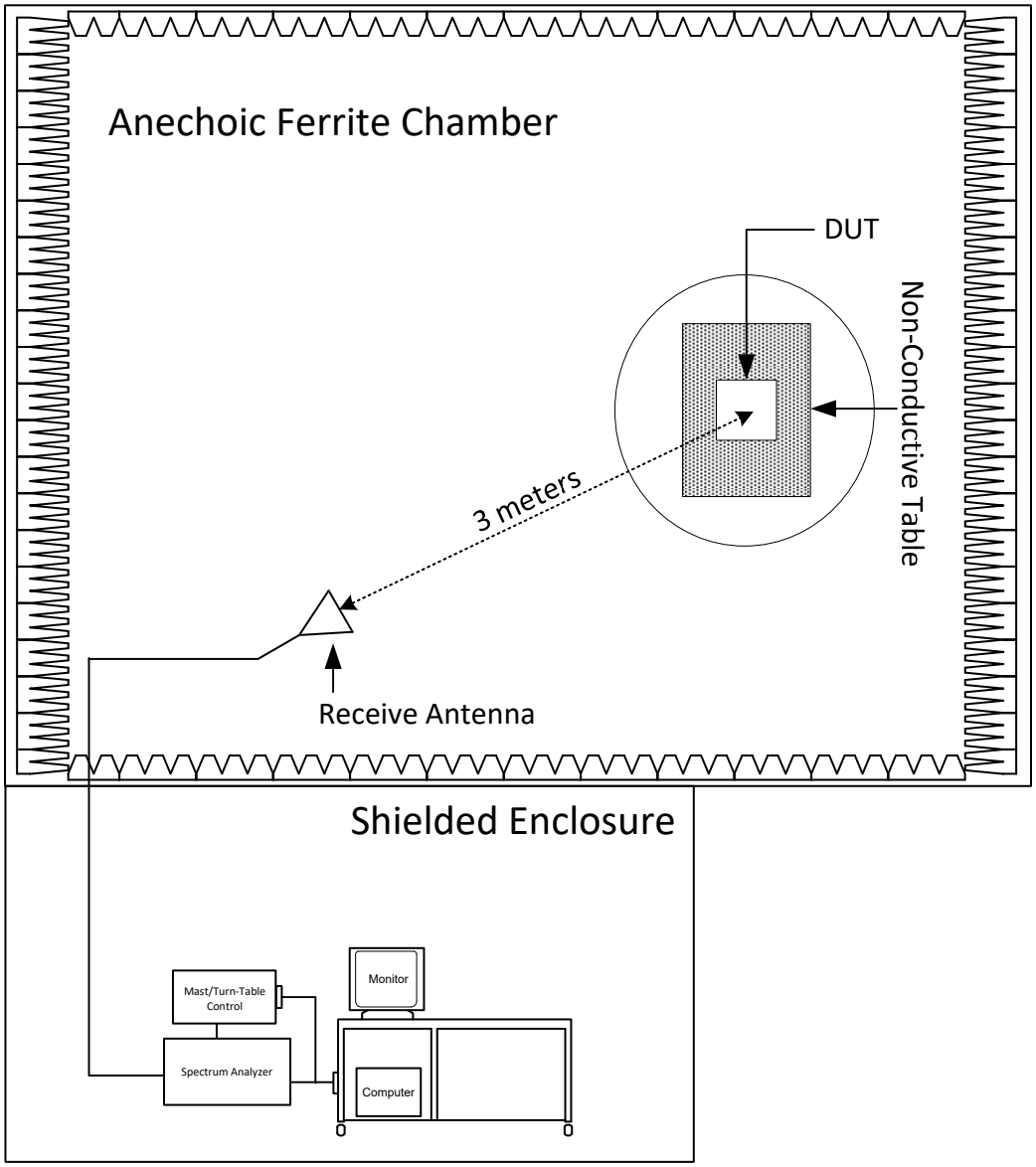


18. Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW10	Preamplifier	Planar	PE2-35-120-5R0-10-12-SFF	PL11685/1241	1-18GHz	3/18/2025	3/18/2026
CDM5	Lab Computer	ELITE		---	---	N/A	
CDM6	Lab Computer	ELITE		---	---	N/A	
GRB0	1MHZ, LISN SIGNAL CHECKER	Elite	LISNCHKR1M	1	1MHZ	2/11/2025	2/11/2027
GSE2	SIGNAL GENERATOR (40GHZ)	ROHDE & SCHWARZ	SMB100A	183293	100KHZ-40GHZ	3/7/2025	3/7/2027
MEA4	MICRO-OHM METER	KEITHLEY	580	0796333	10UOHM-200KOHM	2/14/2025	2/14/2026
NTA2	BILOG ANTENNA	TESEQ	6112D	28040	25-2000MHz	6/21/2024	6/21/2026
NWQ1	Double Ridged Waveguide	ETS-Lindgren	3117	66655	1-18GHz	7/26/2024	7/26/2026
PLF1	CISPR16 50UH LISN	Elite	CISPR16/70A	001	150kHz-30MHz	3/28/2025	3/28/2026
PLF2	CISPR16 50UH LISN	Elite	CISPR16/70A	002	150kHz-30MHz	5/28/2025	5/28/2026
RBG3	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101592	2HZ-44GHZ	5/4/2025	5/4/2026
RBG4	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	103007	2HZ-44GHZ	4/5/2025	4/5/2026
RBH9	EMI Analyzer	Rohde & Schwarz	ESW26	103308	2HZ-26GHZ	11/13/2025	11/13/2026
SES0	24VDC POWER SUPPLY	P-TRANS	FS-32024-1M	001	18-27VDC	NOTE 1	
T1EF	Attenuator	WEINSCHEL	46-10-34	CD3550	DC-18GHz, 10dB, 25W	10/11/2024	10/11/2026
VBR8	COMMERCIAL CONDUCTED EMISSIONS.EXE	ELITE				N/A	
VBV2	COMMERCIAL RADIATED EMISSIONS.EXE	ELITE		---	---	N/A	
XLJV	50Ω Terminations	JFW	50T-052	---	DC-3GHz, 5W	12/21/2023	12/21/2025
XPQ7	HIGH PASS FILTER	K&L MICROWAVE	4IH30-1804/T10000-0	5	1.8-10GHZ	2/4/2025	2/4/2027

N/A: Not Applicable I/O: Initial Only CNR: Calibration Not Required
NOTE 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

19. Block Diagram of Test Setup



Radiated Measurements Test Setup

20. Transmitter Conducted Emissions (AC Mains)

Test Information	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On Tx Off

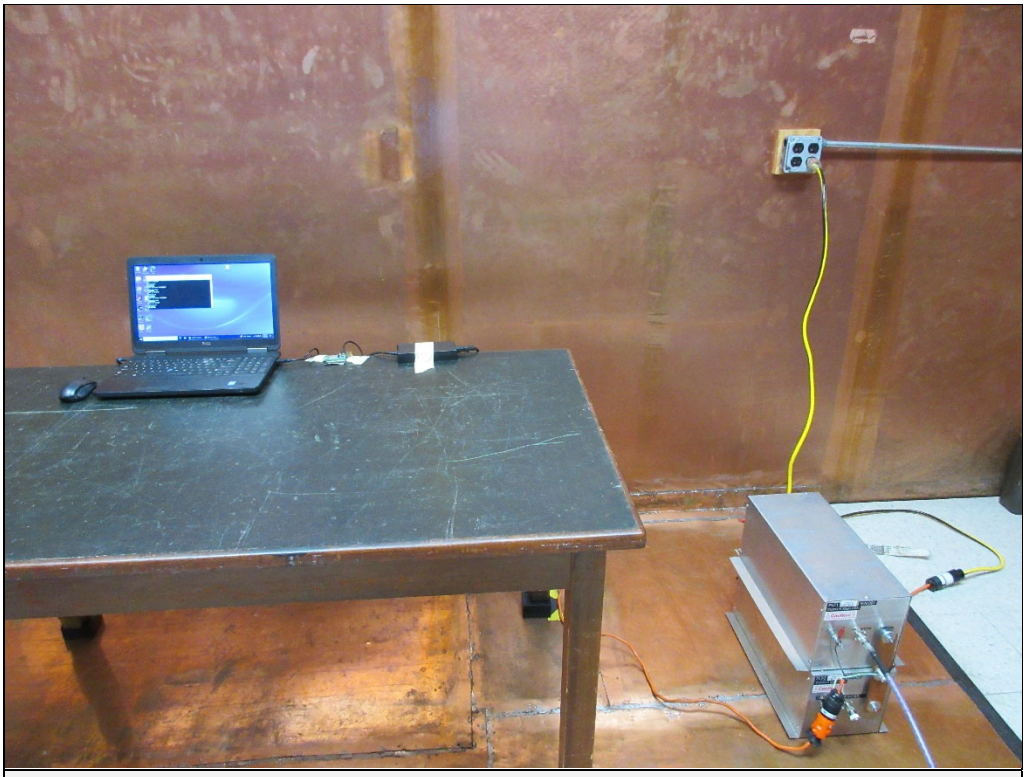
Test Setup Details	
Setup Format	Tabletop
Type of Test Site	Reverberation Chamber
Test Site Used	Room #23S
Notes	None

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Conducted disturbance (mains port) (150 kHz – 30 MHz)	2.7

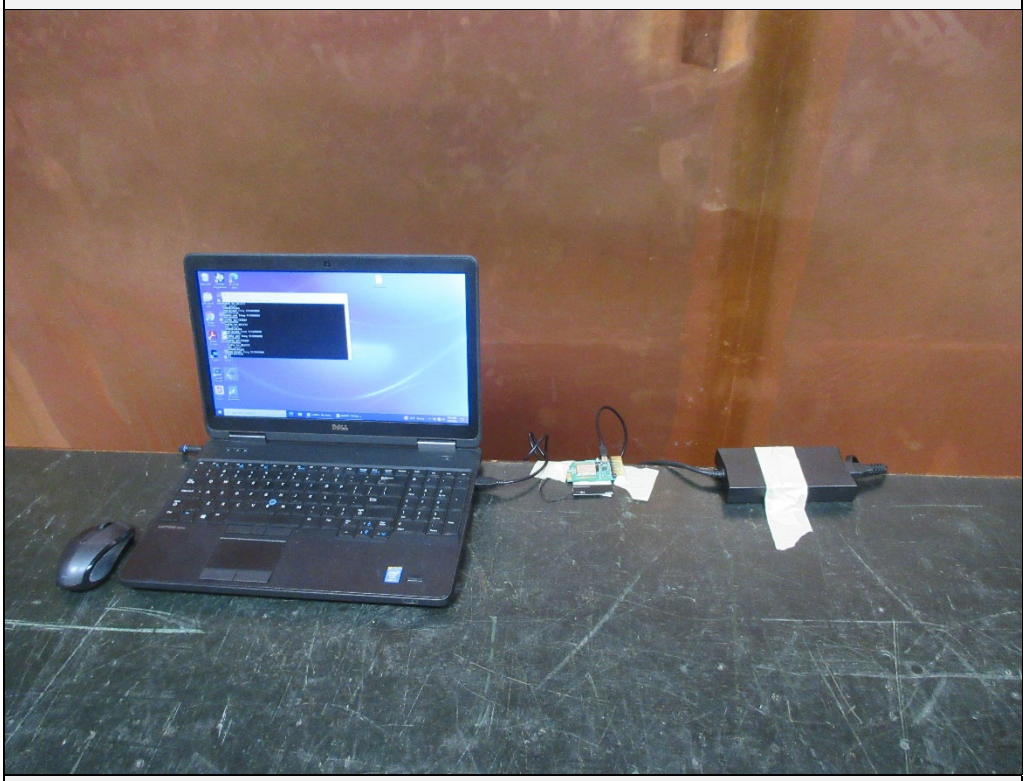
Requirements
All radio frequency voltages on the power lines for any frequency or frequencies of an intentional radiator shall not exceed the limits in the following table:

Transmitter Conducted Emissions Limits		
Frequency of Emission (MHz)	Conducted Limits (dBµV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56-46*
0.5 – 5	56	46
5 – 30	60	50
* The lower limit shall apply at the transition frequencies.		

Procedure
The interference on each power lead of the EUT was measured by connecting the measuring equipment to the appropriate meter terminal of the Line Impedance Stabilization Network (LISN). The meter terminal of the LISN not under test was terminated with 50 ohms. 1) The EUT was operated in the Tx On mode. 2) Measurements were first made on the 120V 60Hz high line. 3) The frequency range from 150kHz to 30MHz was broken up into smaller frequency sub-bands. 4) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector. 5) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 10dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 10dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.) 6) Steps (4) and (5) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits. The resultant voltage level (VL) is a summation in decibels (dB) of the receiver meter reading (MTR) and the cable loss factor (CF). Formula 1: VL (dBµV) = MTR (dBµV) + CF (dB) 7) Steps (3) through (6) were repeated on the 120V 60Hz return line. 8) Steps (2) through (7) were repeated with the EUT operated in the Tx Off mode.



Test Setup for RF Conducted Emissions (AC Mains)



Test Setup for RF Conducted Emissions (AC Mains)

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 09/05/2025

Manufacturer	:	Fastenal
Model	:	RN2903
EUT Revision	:	N/A
Serial Number	:	N/A
EUT Mode	:	TX On 915 MHz
Line Tested	:	Line
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	None
Test Engineer	:	E. Casas
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Dec 02, 2025 10:41:08 AM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

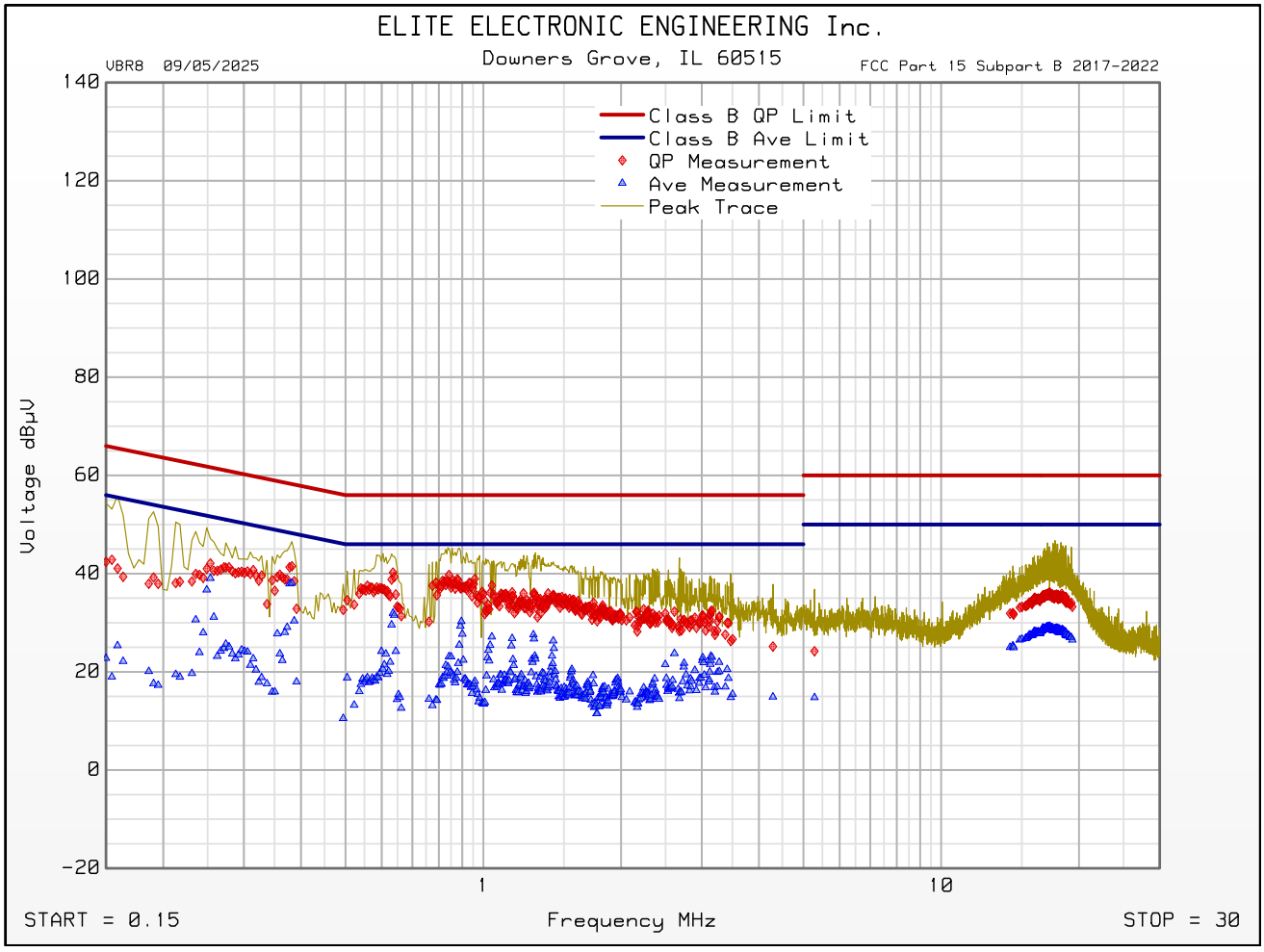
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.254	42.1	61.6		39.0	51.6	
0.382	41.5	58.2		38.1	48.2	
0.635	40.2	56.0		31.9	46.0	
0.842	39.8	56.0		23.1	46.0	
1.291	36.1	56.0		26.7	46.0	
2.241	32.7	56.0		16.8	46.0	
3.157	32.5	56.0		23.0	46.0	
5.288	24.2	60.0		14.8	50.0	
16.021	35.1	60.0		27.9	50.0	
17.230	36.2	60.0		29.2	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 09/05/2025

Manufacturer	:	Fastenal
Model	:	RN2903
EUT Revision	:	N/A
Serial Number	:	N/A
EUT Mode	:	TX On 915 MHz
Line Tested	:	Line
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	None
Test Engineer	:	E. Casas
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Dec 02, 2025 10:41:08 AM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 09/05/2025

Manufacturer	:	Fastenal
Model	:	RN2903
EUT Revision	:	N/A
Serial Number	:	N/A
EUT Mode	:	TX On 915 MHz
Line Tested	:	Return
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	None
Test Engineer	:	E. Casas
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Dec 02, 2025 11:05:29 AM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

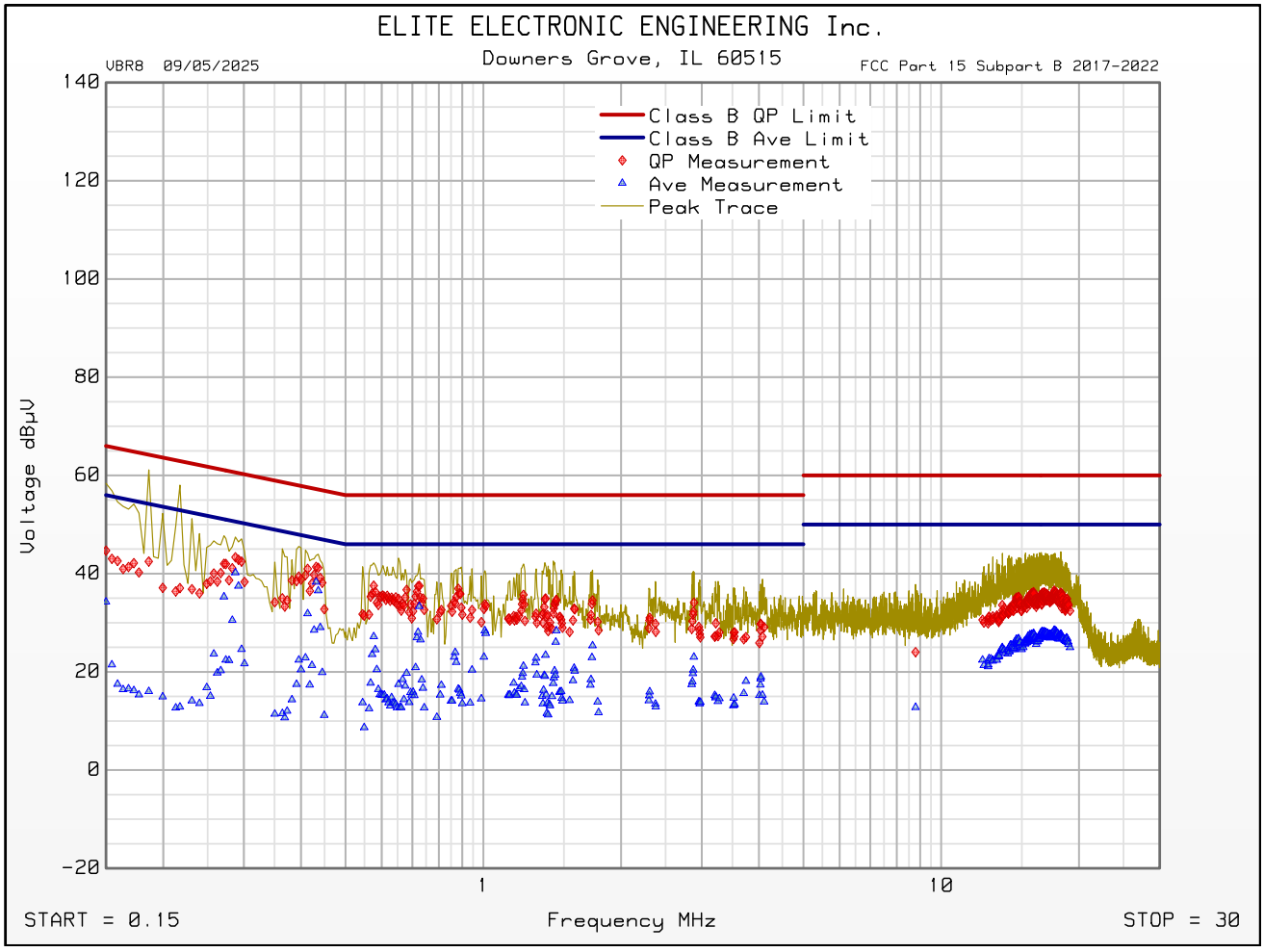
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.274	42.0	61.0		22.4	51.0	
0.432	41.4	57.2		38.3	47.2	
0.577	37.5	56.0		27.2	46.0	
0.882	36.9	56.0		16.5	46.0	
1.368	35.0	56.0		23.4	46.0	
2.885	34.1	56.0		23.0	46.0	
3.220	29.9	56.0		15.0	46.0	
8.789	24.0	60.0		12.8	50.0	
15.904	36.3	60.0		27.8	50.0	
17.658	36.6	60.0		28.4	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 09/05/2025

Manufacturer	:	Fastenal
Model	:	RN2903
EUT Revision	:	N/A
Serial Number	:	N/A
EUT Mode	:	TX On 915 MHz
Line Tested	:	Return
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	None
Test Engineer	:	E. Casas
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Dec 02, 2025 11:05:29 AM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 09/05/2025

Manufacturer	:	Fastenal
Model	:	RN2903
EUT Revision	:	N/A
Serial Number	:	N/A
EUT Mode	:	Tx Off
Line Tested	:	Line
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	None
Test Engineer	:	E. Casas
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Dec 02, 2025 01:13:38 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

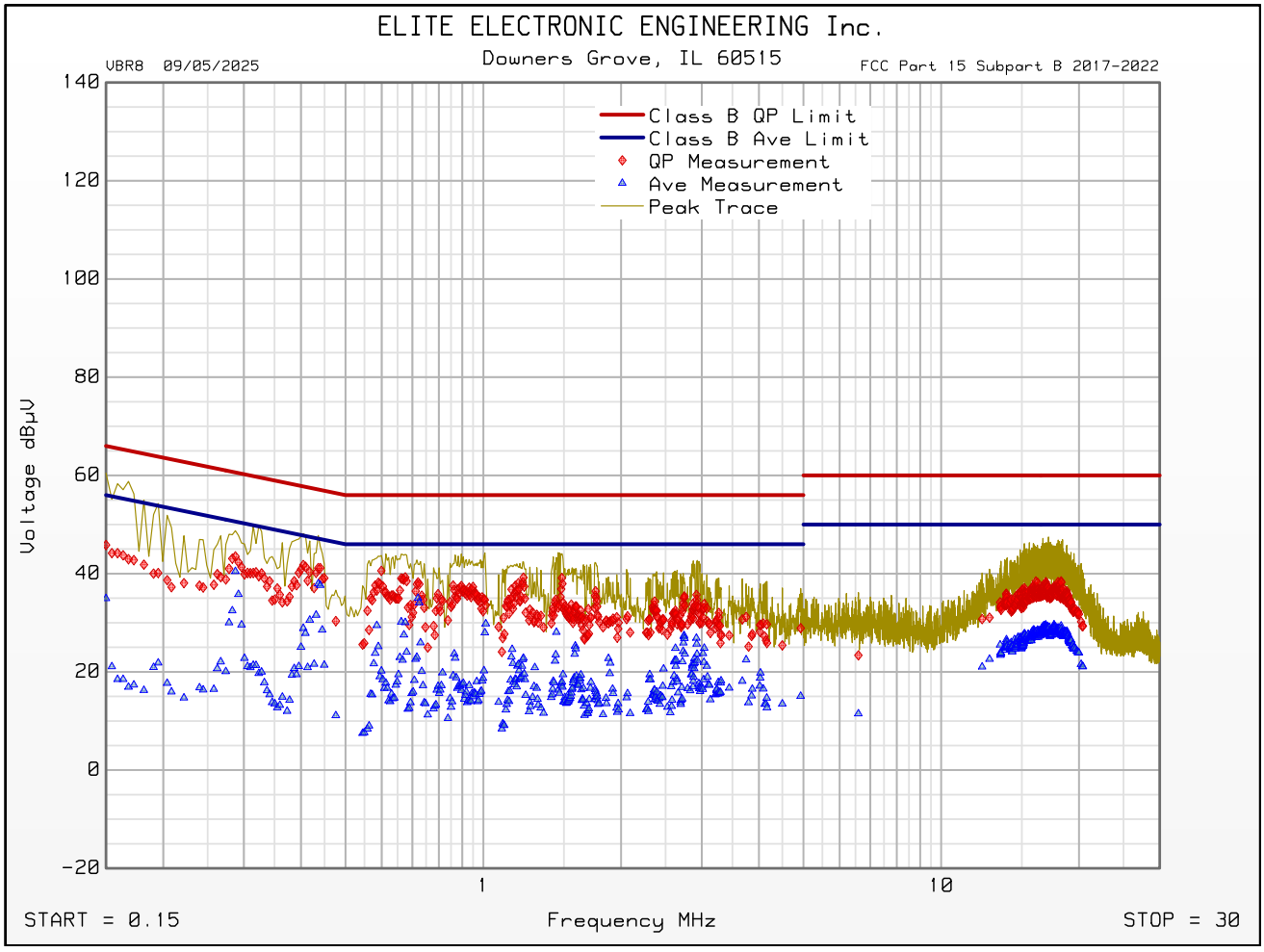
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.150	45.8	66.0		35.0	56.0	
0.436	41.1	57.1		38.0	47.1	
0.599	40.6	56.0		20.2	46.0	
1.224	39.2	56.0		22.8	46.0	
1.485	39.1	56.0		18.0	46.0	
2.921	35.7	56.0		26.9	46.0	
3.269	32.0	56.0		16.0	46.0	
6.593	23.4	60.0		11.5	50.0	
16.093	38.4	60.0		28.1	50.0	
18.274	38.4	60.0		29.3	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 09/05/2025

Manufacturer	:	Fastenal
Model	:	RN2903
EUT Revision	:	N/A
Serial Number	:	N/A
EUT Mode	:	Tx Off
Line Tested	:	Line
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	None
Test Engineer	:	E. Casas
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Dec 02, 2025 01:13:38 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 09/05/2025

Manufacturer	:	Fastenal
Model	:	RN2903
EUT Revision	:	N/A
Serial Number	:	N/A
EUT Mode	:	Tx Off
Line Tested	:	Return
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	None
Test Engineer	:	E. Casas
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Dec 02, 2025 12:10:02 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 10 dB margin below limit

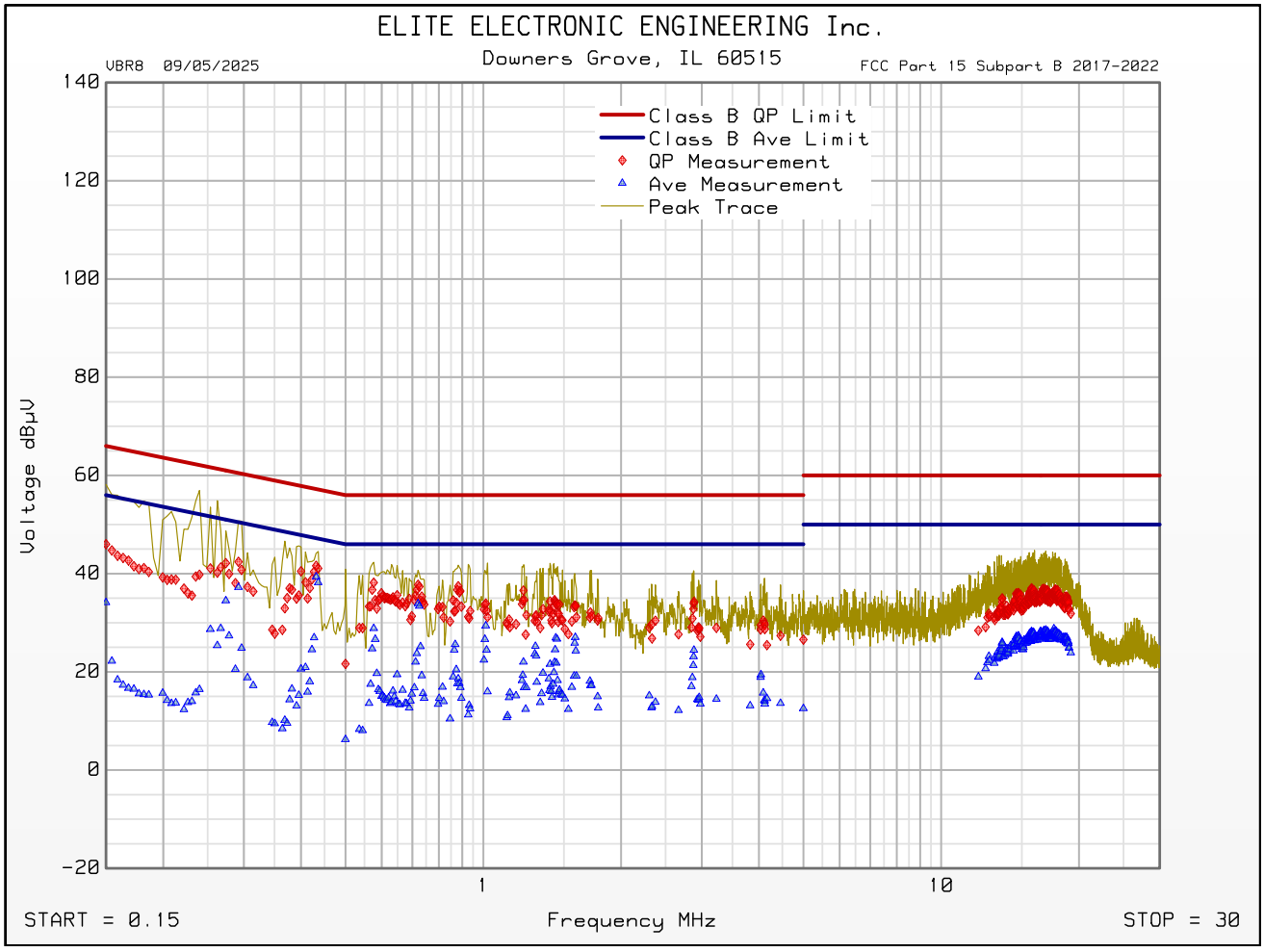
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.274	42.1	61.0		34.5	51.0	
0.432	41.6	57.2		39.4	47.2	
0.577	38.2	56.0		28.9	46.0	
0.882	37.4	56.0		18.6	46.0	
1.431	34.6	56.0		22.0	46.0	
2.885	34.3	56.0		24.4	46.0	
4.088	30.4	56.0		15.7	46.0	
5.000	26.6	56.0		12.5	46.0	
15.746	37.0	60.0		28.1	50.0	
16.762	36.9	60.0		28.3	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 09/05/2025

Manufacturer	:	Fastenal
Model	:	RN2903
EUT Revision	:	N/A
Serial Number	:	N/A
EUT Mode	:	Tx Off
Line Tested	:	Return
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-10
Notes	:	None
Test Engineer	:	E. Casas
RBW	:	9 kHz
Limit	:	Class B
Test Date	:	Dec 02, 2025 12:10:02 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

21. 6dB Bandwidth

EUT Information	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On

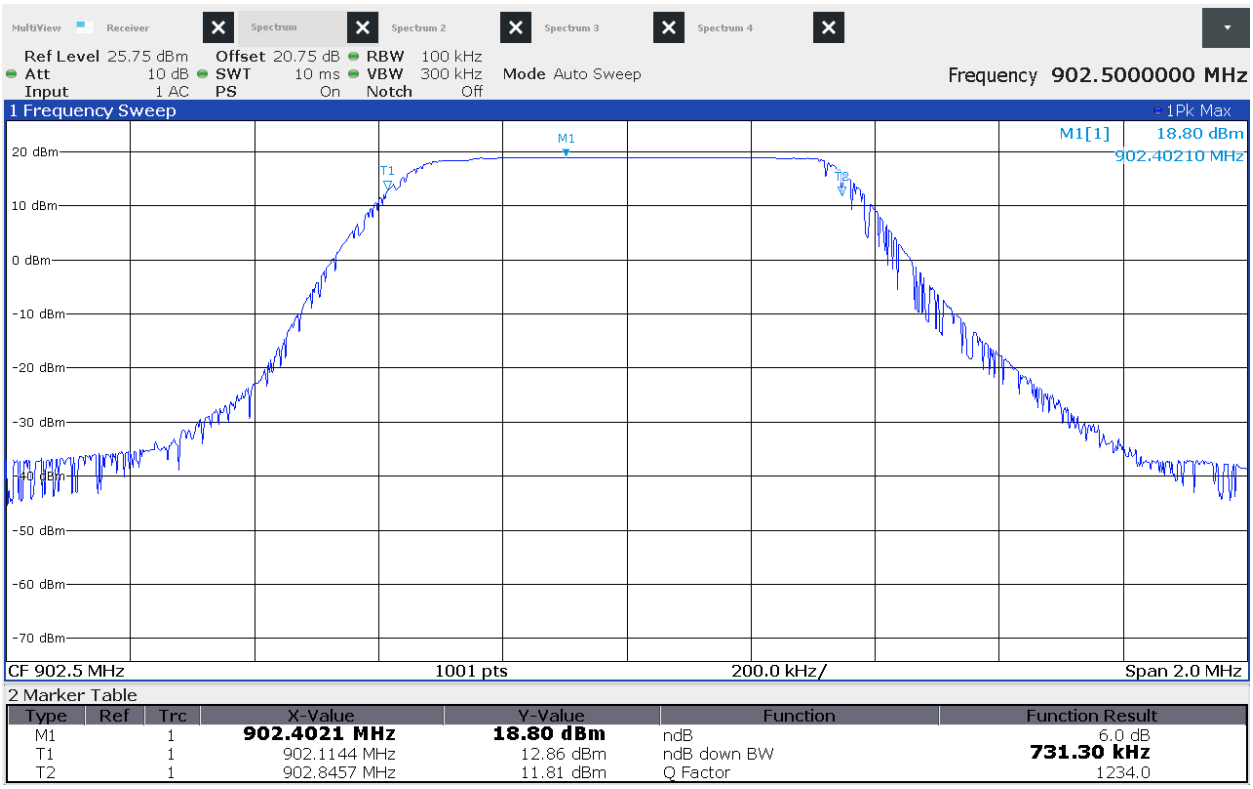
Test Setup Details	
Setup Format	Tabletop
Measurement Method	Antenna Conducted
Type of Test Site	Tabletop
Test Site Used	N/A
Type of Antennas Used	N/A
Notes	None

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1

Requirements
Systems using digital modulation techniques shall have a minimum 6dB bandwidth of 500kHz

Procedure
The antenna port of the EUT was connected to the spectrum analyzer through 20dB of attenuation. The EUT was allowed to transmit continuously. The transmit channel was set separately to low, middle, and high channels. The resolution bandwidth (RBW) was set to 100kHz, the video bandwidth (VBW) was set to the same as or 3 times greater than the RBW, and the span was set to 3 times the RBW. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's display was then screenshot and saved.

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	902.5MHz
Result	6dB BW = 731.30kHz
Notes	None

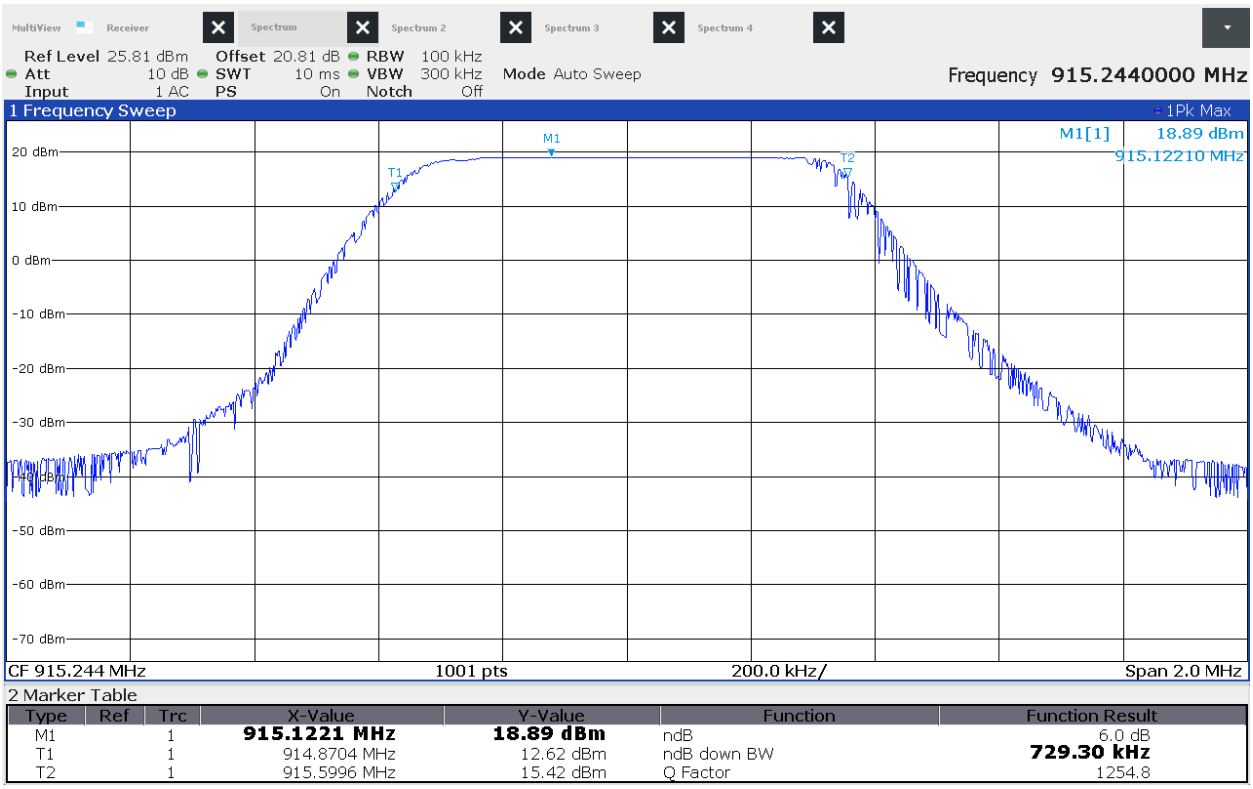


6dB BW

Manufacturer : Fastenal
Model Number : RN2903A
Serial Number :
Mode : Low 902.5MHz
Parameters :
Date : 12/3/2025 10:45:56 AM
Notes : None

TRACE1 : Function plot of Max Hold Peak

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	915.244MHz
Result	6dB BW = 729.3kHz
Notes	None

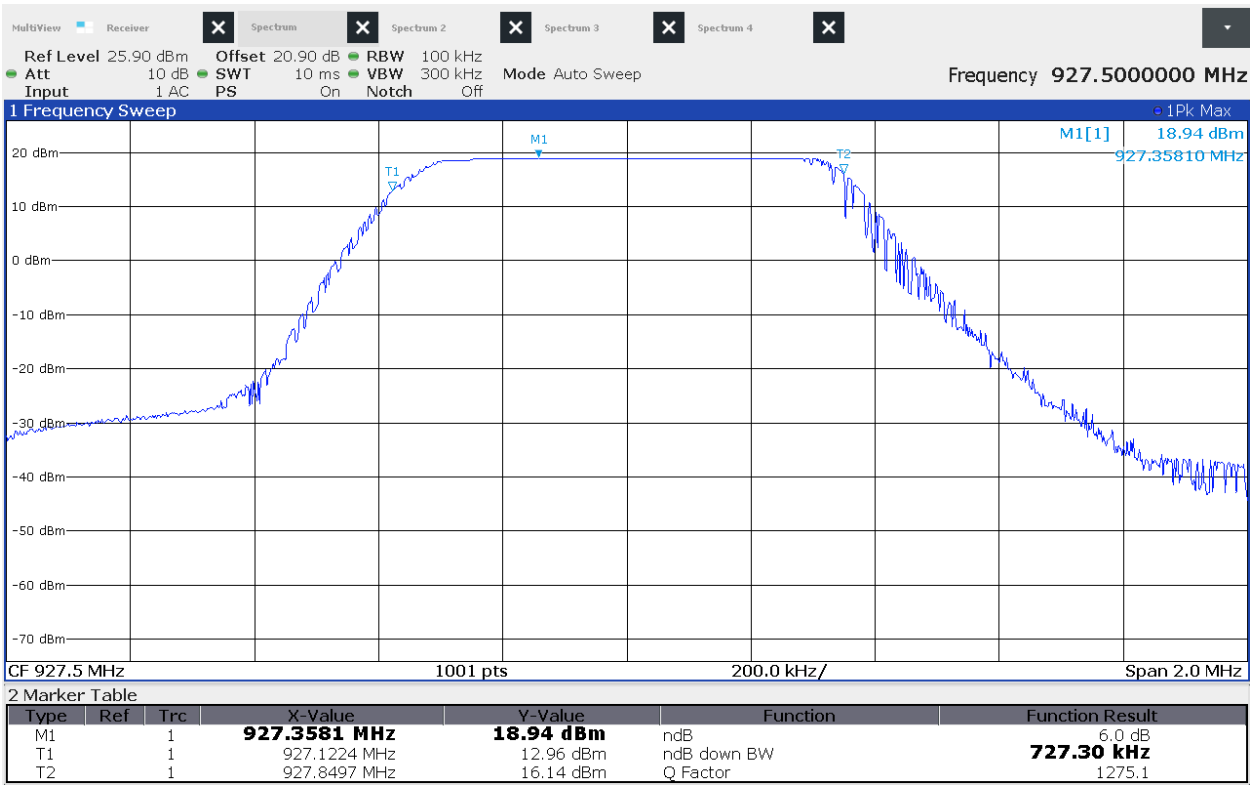


6dB BW

Manufacturer : Fastenal
Model Number : RN2903A
Serial Number :
Mode : Mid 915.244MHz
Parameters :
Date : 12/3/2025 12:47:35 PM
Notes : None

TRACE1 : Function plot of Max Hold Peak

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	927.5MHz
Result	6dB BW = 727.30kHz
Notes	None



6dB BW

Manufacturer : Fastenal
Model Number : RN2903A
Serial Number :
Mode : High 927.5MHz
Parameters :
Date : 12/3/2025 11:32:02 AM
Notes :

TRACE1 : Function plot of Max Hold Peak

22. Occupied Bandwidth (99%)

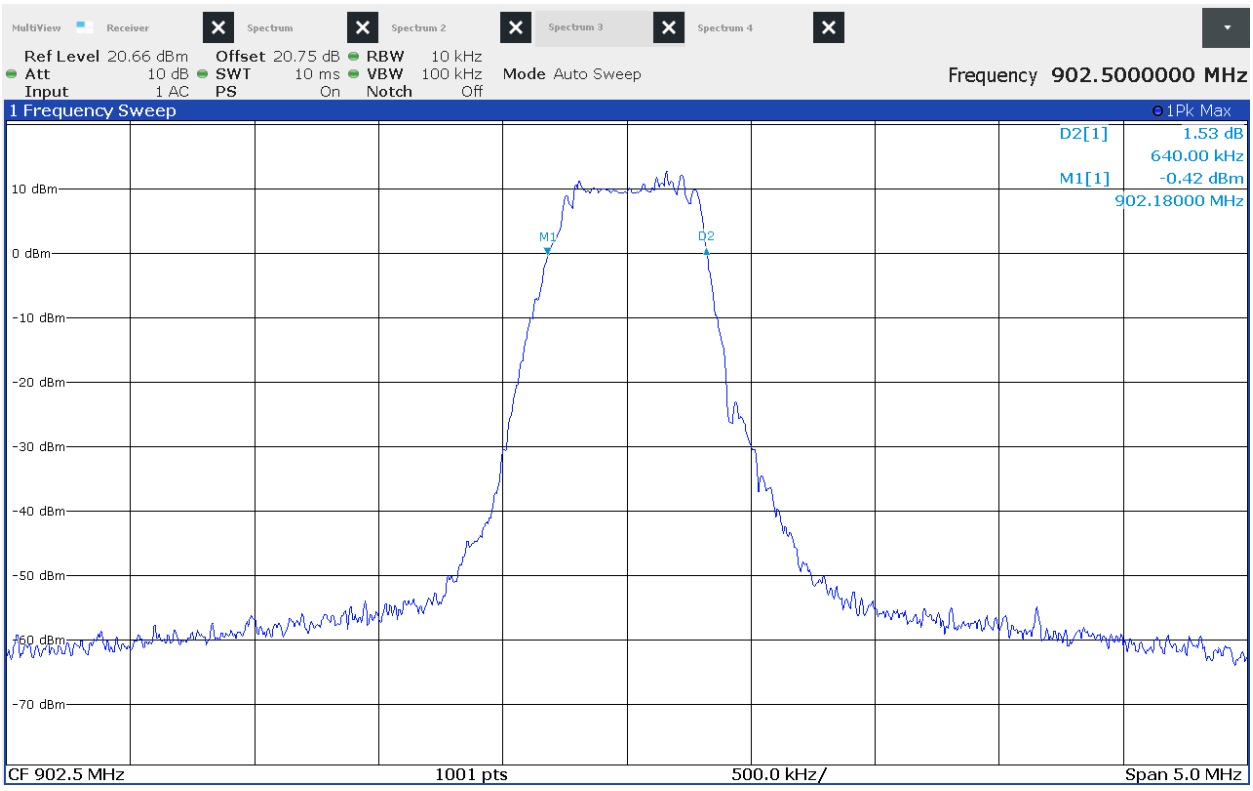
EUT Information	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On

Test Setup Details	
Setup Format	Tabletop
Measurement Method	Antenna Conducted
Type of Test Site	Tabletop
Test Site Used	N/A
Type of Antennas Used	N/A
Notes	None

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1

Procedure
The antenna port of the EUT was connected to the spectrum analyzer through 20dB of attenuation. The EUT was allowed to transmit continuously. The transmit channel was set separately to low, middle, and high channels. The resolution bandwidth (RBW) was set to 1% to 5% of the actual occupied bandwidth, the video bandwidth (VBW) was set 3 times greater than the RBW, and the span was set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's display was plotted using a 'screen dump' utility.

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	902.5MHz
Result	OBW = 640kHz
Notes	None

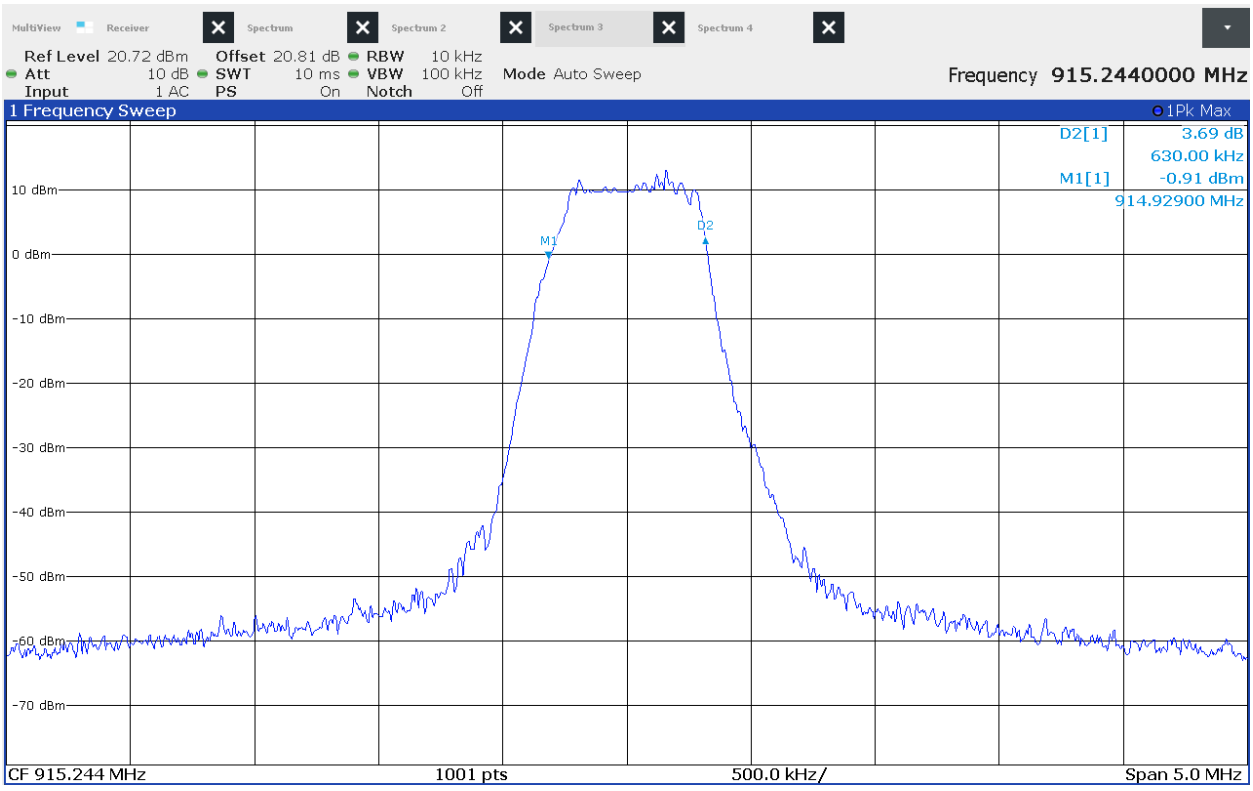


99% BW

Manufacturer : Fastenal
Model Number : RN2903A
Serial Number :
Mode : Low 902.5MHz
Parameters :
Date : 12/3/2025 2:05:33 PM
Notes :

TRACE1 : Function plot of Max Hold Peak

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	915.244MHz
Result	OBW = 630kHz
Notes	None

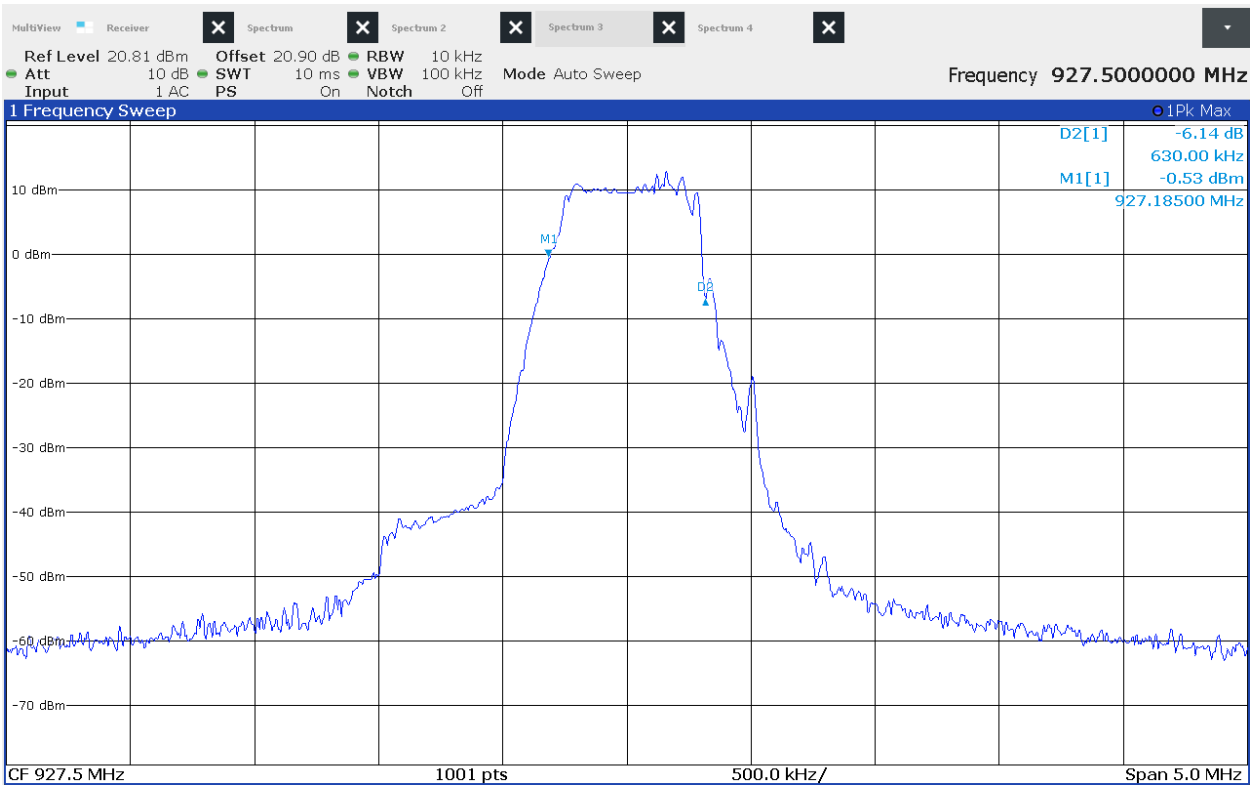


99% BW

Manufacturer : Fastenal
Model Number : RN2903A
Serial Number :
Mode : Mid 915.244MHz
Parameters :
Date : 12/3/2025 1:58:05 PM
Notes :

TRACE1 : Function plot of Max Hold Peak

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	927.5MHz
Result	OBW = 630kHz
Notes	None



99% BW

Manufacturer : Fastenal
Model Number : RN2903A
Serial Number :
Mode : High 927.5MHz
Parameters :
Date : 12/3/2025 1:50:38 PM
Notes :

TRACE1 : Function plot of Max Hold Peak

23. Maximum Peak Conducted Output Power

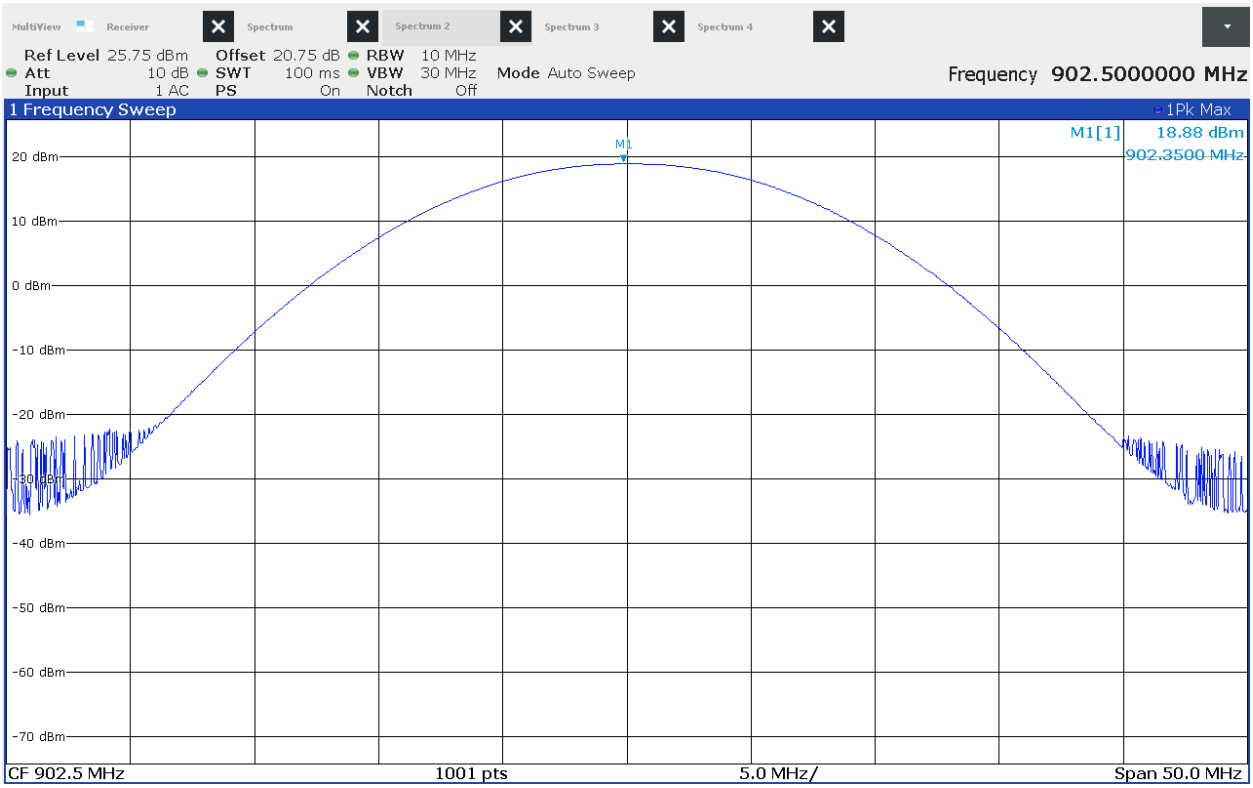
EUT Information	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On

Test Setup Details	
Setup Format	Tabletop
Measurement Method	Antenna Conducted
Type of Test Site	Tabletop
Test Site Used	N/A
Notes	None

Requirements
The output power shall not exceed 1W (30dBm).

Procedure
The antenna port of the EUT was connected to the spectrum analyzer through 20dB of attenuation. The EUT was set to transmit separately at the low, middle, and high channels. The resolution bandwidth (RBW) was set to greater than the 6dB bandwidth. The span was set to greater than 3 times the RBW. The 'Max-Hold' function was engaged. The maximum meter reading was recorded. The peak power output was calculated for the low, middle, and high channels.

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	902.5MHz
Result	Output Power = 77.27mW (18.88dBm)
Notes	None

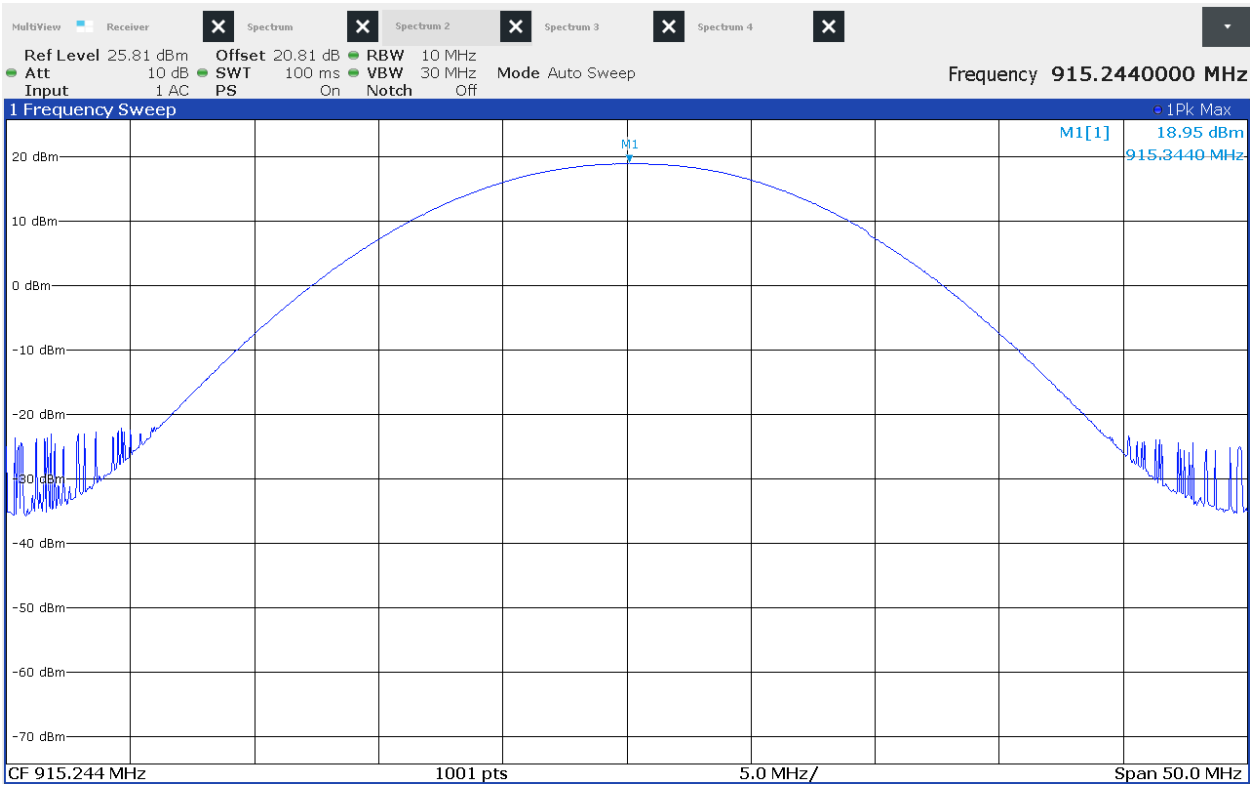


Conducted Output Power

Manufacturer : Fastenal
Model Number : RN2903A
Serial Number :
Mode : Low 902.5MHz
Parameters :
Date : 12/3/2025 10:49:46 AM
Notes :

TRACE1 : Function plot of Max Hold Peak

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	915.244MHz
Result	Output Power = 78.52mW (18.95dBm)
Notes	None

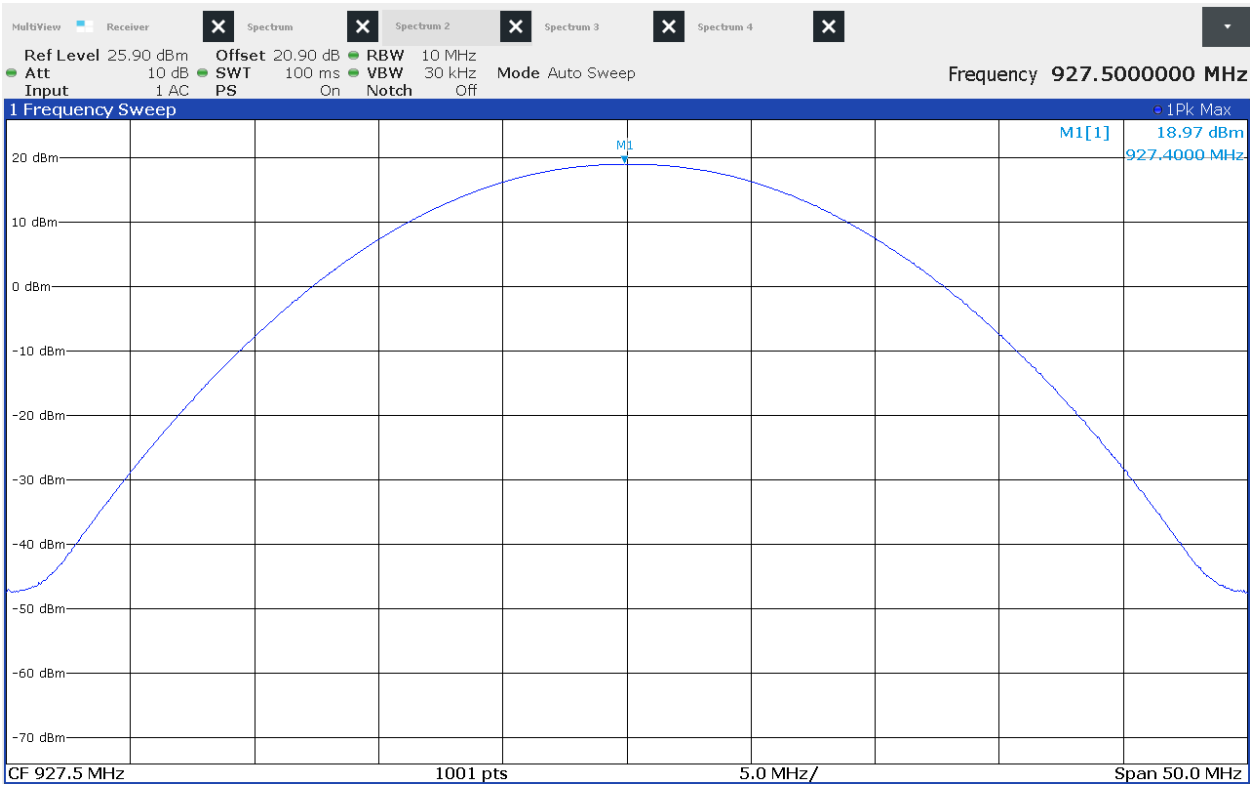


Conducted Output Power

Manufacturer : Fastenal
Model Number : RN2903A
Serial Number :
Mode : Mid 915.244MHz
Parameters :
Date : 12/3/2025 12:50:56 PM
Notes :

TRACE1 : Function plot of Max Hold Peak

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	927.5MHz
Result	Output Power = 78.89mW (18.97dBm)
Notes	None



Conducted Output Power

Manufacturer : Fastenal
Model Number : RN2903A
Serial Number :
Mode : High 927.5MHz
Parameters :
Date : 12/3/2025 11:34:37 AM
Notes :

TRACE1 : Function plot of Max Hold Peak

24. Effective Isotropic Radiated Power (EIRP)

EUT Information	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On

Test Setup Details	
Setup Format	Tabletop
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	Room #29
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Notes	None

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1

Requirements
The output power shall not exceed 4W (36dBm).

Procedure
The EUT was placed on the non-conductive stand and set to transmit. A bilog antenna was placed at a test distance of 3 meters from the EUT. The resolution bandwidth (RBW) of the spectrum analyzer was set to greater than the 6dB bandwidth. The EUT was maximized for worst case emissions (or maximum output power) at the measuring antenna. The maximum meter reading was recorded. The peak power output was measured for the low, middle, and high channels. The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, a dipole antenna (double ridged waveguide antenna for all measurements above 1GHz) was then set in place of the EUT and connected to a calibrated signal generator. The output of the signal generator was adjusted to match the received level at the spectrum analyzer. The signal level was recorded. The reading was then corrected to compensate for cable loss (and antenna gain for all measurements above 1GHz), as required. The peak power output was calculated for low, middle, and high hopping frequencies.

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Result	Max EIRP = 112.2mW (20.5dBm)
Notes	None

Freq (MHz)	Ant Pol	Wide BW Meter Reading (dBµV)	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total (dBµV/m)	EIRP (dBm)	Limit (dBm)	Margin (dB)
902.50	H	87.4	1.5	26.7	0.0	115.6	20.3	36.0	-15.7
	V	85.3	1.5	26.7	0.0	113.5	18.2	36.0	-17.8
915.24	H	87.6	1.6	26.7	0.0	115.8	20.5	36.0	-15.5
	V	82.9	1.6	26.7	0.0	111.1	15.8	36.0	-20.2
927.50	H	87.3	1.6	26.9	0.0	115.7	20.4	36.0	-15.6
	V	82.2	1.6	26.9	0.0	110.7	15.4	36.0	-20.6

25. Spurious Radiated Emissions

EUT Information	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On

Test Setup Details	
Setup Format	Tabletop
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	Room #29
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-Ridged Waveguide (or equivalent)
Notes	N/A

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Procedure

Radiated measurements were performed in a 32ft. x 20ft. x 14ft. high shielded enclosure. The shielded enclosure prevents emissions from other sources, such as radio and TV stations, from interfering with the measurements. All power lines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

Preliminary radiated emissions tests were performed to determine the emission characteristics of the EUT. For the preliminary test, a broadband measuring antenna was positioned at a 3 meter distance from the EUT. The entire frequency range from 30MHz to 10.0GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 10.0GHz.

1) For all harmonics not in the restricted bands, the following procedure was used:
   a) The field strength of the fundamental was measured using a bilog antenna. The bilog was positioned at a 3 meter distance from the EUT. The EUT was placed on an 80cm high non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.
   b) The field strengths of all of the harmonics not in the restricted band were then measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on a 1.5 meter high non-conductive stand. A peak detector with a resolution bandwidth of 100kHz was used on the spectrum analyzer.
   c) To ensure that maximum or worst case emission levels at the fundamental and harmonics were measured, the following steps were taken when measuring the fundamental emissions and the spurious emissions:
      i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
      ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
      iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.
      iv) In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer, the measuring antenna was not raised or lowered to ensure maximized readings. Instead, the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.
   d) All harmonics not in the restricted bands must be at least 20dB below levels measured at the fundamental. However, attenuation below the general limits specified in §15.209(a) is not required.
2) For all emissions in the restricted bands, the following procedure was used:
   a) The field strengths of all emissions below 1GHz were measured using a bi-log antenna. The bi-log antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on an 80cm high non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.
   b) The field strengths of all emissions above 1GHz were measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on a 1.5 meter high non-conductive stand. A peak detector with a resolution bandwidth of 1MHz was used on the spectrum analyzer.
   c) To ensure that maximum or worst case emission levels were measured, the following steps were taken when taking all measurements:
      i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
      ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components

were measured.

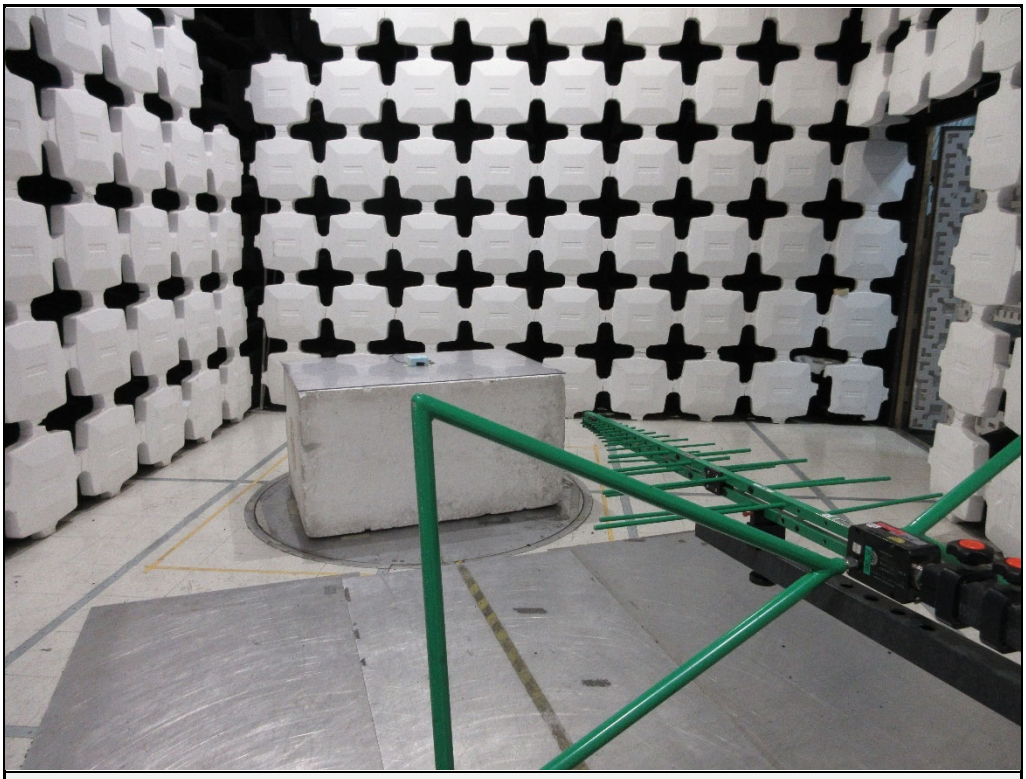
iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.

iv) In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer, the measuring antenna was not raised or lowered to ensure maximized readings. Instead, the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.

d) For all radiated emissions measurements below 1GHz, if the peak reading is below the limits listed in §15.209(a), no further measurements are required. If, however, the peak readings exceed the limits listed in §15.209(a), then the emissions are remeasured using a quasi-peak detector.

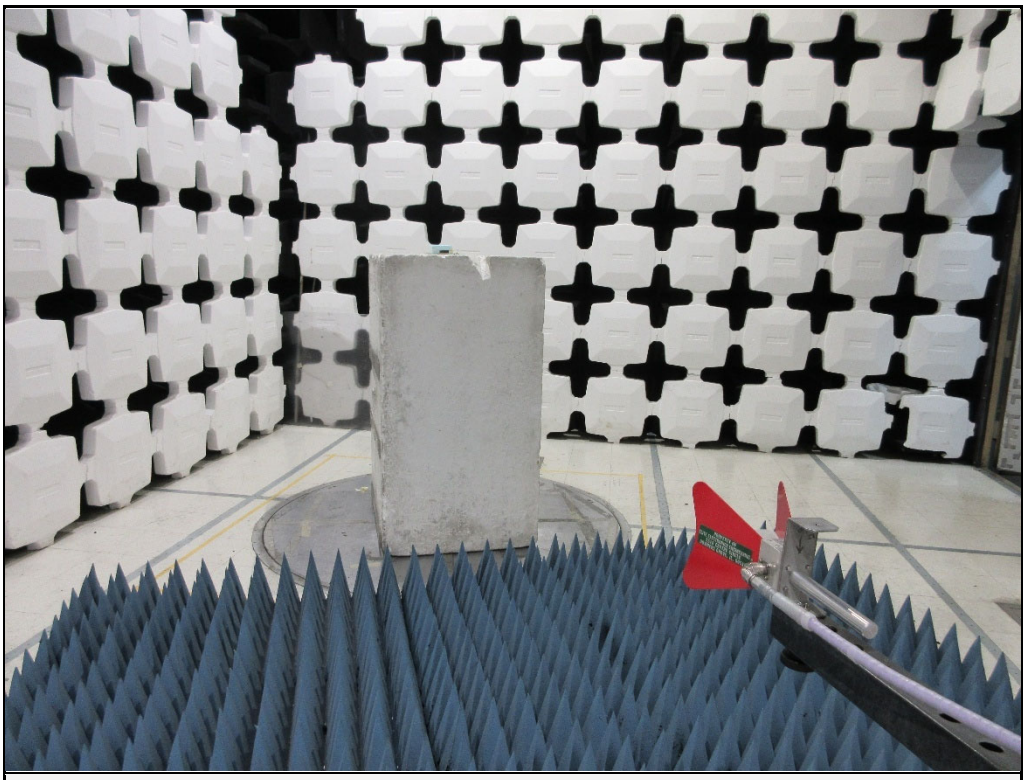
e) For all radiated emissions measurements above 1GHz, the peak readings must comply with the §15.35(b) limits. §15.35(b) states that when average radiated emissions measurements are specified, there also is a limit on the peak level of the radiated emissions. The limit on the peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. Therefore, all peak readings above 1GHz must be no greater than 20dB above the limits specified in §15.209(a).

f) Next, for all radiated emissions measurements above 1GHz, the resolution bandwidth was set to 1MHz. The analyzer was set to linear mode with a 10Hz video bandwidth in order to simulate an average detector. An average reading was taken.

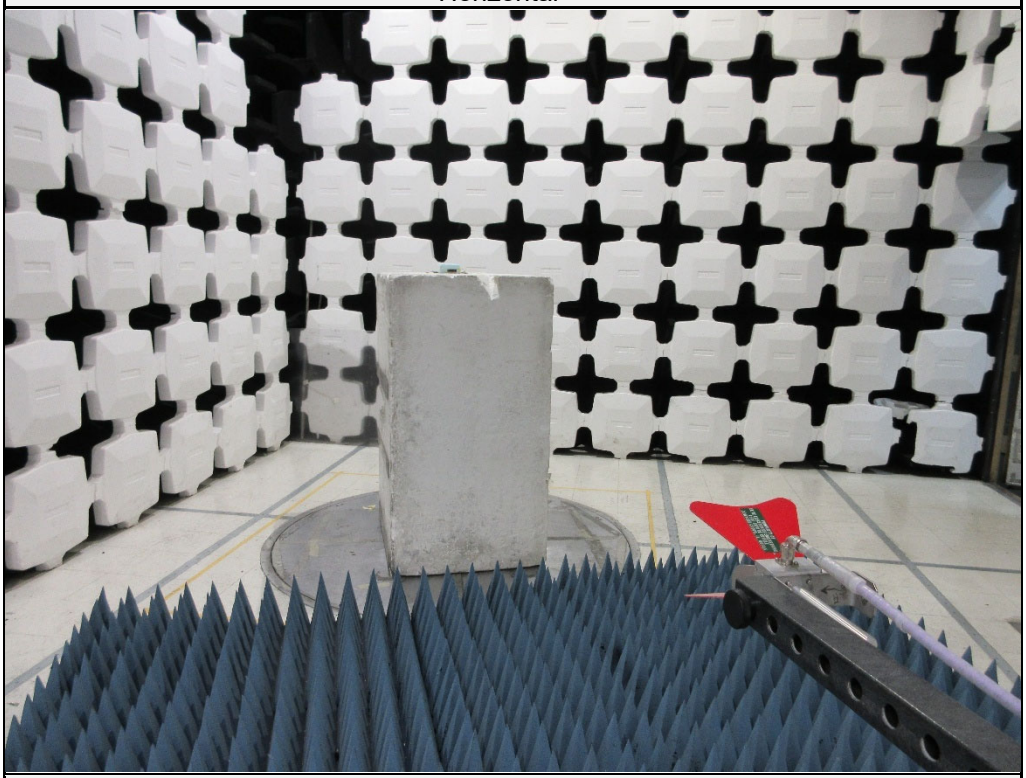


Test Setup for Spurious Radiated Emissions, 30MHz – 1GHz – Antenna Polarization Horizontal

Test Setup for Spurious Radiated Emissions, 30MHz – 1GHz – Antenna Polarization Vertical



Test Setup for Spurious Radiated Emissions, Above 1GHz – Antenna Polarization Horizontal



Test Setup for Spurious Radiated Emissions, Above 1GHz – Antenna Polarization Vertical

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	902.5MHz
Notes	Peak Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dB)
2707.50	H	52.3		2.8	33.1	-39.8	48.4	264.0	5000.0	-25.5
	V	50.9		2.8	33.1	-39.8	47.0	223.4	5000.0	-27.0
3610.00	H	49.3	*	3.2	33.2	-39.2	46.5	211.9	5000.0	-27.5
	V	49.4	*	3.2	33.2	-39.2	46.7	215.3	5000.0	-27.3
4512.50	H	49.8	*	3.6	34.2	-39.2	48.4	262.1	5000.0	-25.6
	V	50.5	*	3.6	34.2	-39.2	49.1	284.8	5000.0	-24.9
5415.00	H	49.9		3.9	34.8	-39.4	49.3	291.7	5000.0	-24.7
	V	51.0		3.9	34.8	-39.4	50.4	330.0	5000.0	-23.6
8122.50	H	49.8	*	4.9	35.8	-39.4	51.1	357.4	5000.0	-22.9
	V	50.4	*	4.9	35.8	-39.4	51.7	384.3	5000.0	-22.3
9025.00	H	50.1	*	5.0	36.2	-39.3	51.9	392.5	5000.0	-22.1
	V	50.0	*	5.0	36.2	-39.3	51.8	390.3	5000.0	-22.2

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	902.5MHz
Notes	Average Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	EUTy Cycle Factor (dB)	Average Total at 3m (dBµV/m)	Average Total at 3m (µV/m)	Average Limit at 3m (µV/m)	Margin (dB)
2707.50	H	45.90		2.8	33.1	-39.8	0.0	42.0	126.1	500.0	-12.0
	V	42.95		2.8	33.1	-39.8	0.0	39.1	89.8	500.0	-14.9
3610.00	H	38.03	*	3.2	33.2	-39.2	0.0	35.3	58.0	500.0	-18.7
	V	37.95	*	3.2	33.2	-39.2	0.0	35.2	57.4	500.0	-18.8
4512.50	H	38.33	*	3.6	34.2	-39.2	0.0	36.9	70.0	500.0	-17.1
	V	38.39	*	3.6	34.2	-39.2	0.0	37.0	70.5	500.0	-17.0
5415.00	H	39.87		3.9	34.8	-39.4	0.0	39.2	91.7	500.0	-14.7
	V	43.70		3.9	34.8	-39.4	0.0	43.1	142.6	500.0	-10.9
8122.50	H	38.11	*	4.9	35.8	-39.4	0.0	39.4	93.4	500.0	-14.6
	V	38.30	*	4.9	35.8	-39.4	0.0	39.6	95.4	500.0	-14.4
9025.00	H	38.11	*	5.0	36.2	-39.3	0.0	39.9	99.2	500.0	-14.1
	V	38.19	*	5.0	36.2	-39.3	0.0	40.0	100.1	500.0	-14.0

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	902.5MHz
Notes	Peak Measurements in Non-Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dB)
902.50	H	87.25		1.5	26.7	0.0	115.5	595660.6	NA	NA
	V	85.14		1.5	26.7	0.0	113.4	467195.7	NA	NA
1805.00	H	43.89		2.2	29.3	-40.0	35.4	59.0	59566.1	-60.1
	V	40.22	*	2.2	29.3	-40.0	31.7	38.6	59566.1	-63.8
6317.50	H	41.25		4.3	35.5	-39.4	41.6	120.6	59566.1	-53.9
	V	42.11		4.3	35.5	-39.4	42.5	133.2	59566.1	-53.0
7220.00	H	38.75	*	4.6	35.7	-39.4	39.7	96.9	59566.1	-55.8
	V	38.98	*	4.6	35.7	-39.4	40.0	99.5	59566.1	-55.5

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	915.244MHz
Notes	Peak Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dB)
2745.73	H	51.2		2.8	33.0	-39.7	47.3	231.8	5000.0	-26.7
	V	50.7	*	2.8	33.0	-39.7	46.8	218.5	5000.0	-27.2
3660.98	H	50.1	*	3.3	33.2	-39.2	47.3	232.8	5000.0	-26.6
	V	50.0	*	3.3	33.2	-39.2	47.3	232.0	5000.0	-26.7
4576.22	H	50.0	*	3.6	34.4	-39.2	48.8	275.8	5000.0	-25.2
	V	49.9	*	3.6	34.4	-39.2	48.7	272.0	5000.0	-25.3
7321.95	H	49.5	*	4.7	35.7	-39.4	50.5	335.5	5000.0	-23.5
	V	49.7	*	4.7	35.7	-39.4	50.7	341.4	5000.0	-23.3
8237.20	H	49.9	*	4.9	35.8	-39.4	51.2	364.4	5000.0	-22.7
	V	49.8	*	4.9	35.8	-39.4	51.2	361.5	5000.0	-22.8
9152.44	H	49.9	*	5.0	36.3	-39.3	51.8	390.6	5000.0	-22.1
	V	49.5	*	5.0	36.3	-39.3	51.4	372.1	5000.0	-22.6

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	915.244MHz
Notes	Average Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	EUTy Cycle Factor (dB)	Average Total at 3m (dBµV/m)	Average Total at 3m (µV/m)	Average Limit at 3m (µV/m)	Margin (dB)
2745.73	H	42.59		2.8	33.0	-39.7	0.0	38.7	85.7	500.0	-15.3
	V	38.93	*	2.8	33.0	-39.7	0.0	35.0	56.2	500.0	-19.0
3660.98	H	38.39	*	3.3	33.2	-39.2	0.0	35.7	60.8	500.0	-18.3
	V	38.23	*	3.3	33.2	-39.2	0.0	35.5	59.7	500.0	-18.5
4576.22	H	38.38	*	3.6	34.4	-39.2	0.0	37.2	72.2	500.0	-16.8
	V	38.52	*	3.6	34.4	-39.2	0.0	37.3	73.4	500.0	-16.7
7321.95	H	37.86	*	4.7	35.7	-39.4	0.0	38.9	87.8	500.0	-15.1
	V	37.77	*	4.7	35.7	-39.4	0.0	38.8	86.8	500.0	-15.2
8237.20	H	38.28	*	4.9	35.8	-39.4	0.0	39.6	95.5	500.0	-14.4
	V	38.14	*	4.9	35.8	-39.4	0.0	39.5	94.0	500.0	-14.5
9152.44	H	37.93	*	5.0	36.3	-39.3	0.0	39.9	98.7	500.0	-14.1
	V	38.07	*	5.0	36.3	-39.3	0.0	40.0	100.3	500.0	-14.0

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	915.244MHz
Notes	Peak Measurements in Non-Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dB)
915.24	H	87.27		1.6	26.7	0.0	115.5	597779.7	NA	NA
	V	82.35		1.6	26.7	0.0	110.6	339266.6	NA	NA
1830.49	H	43.08		2.2	29.5	-40.0	34.8	55.2	59778.0	-60.7
	V	40.35	*	2.2	29.5	-40.0	32.1	40.3	59778.0	-63.4
5491.46	H	41.05		3.9	34.9	-39.4	40.5	105.5	59778.0	-55.1
	V	42.39		3.9	34.9	-39.4	41.8	123.1	59778.0	-53.7
6406.71	H	38.92		4.3	35.6	-39.4	39.4	93.6	59778.0	-56.1
	V	43.29		4.3	35.6	-39.4	43.8	154.7	59778.0	-51.7

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	927.5MHz
Notes	Peak Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dB)
2782.50	H	50.6	*	2.8	32.9	-39.7	46.6	214.6	5000.0	-27.3
	V	50.5	*	2.8	32.9	-39.7	46.5	211.9	5000.0	-27.5
3710.00	H	49.7	*	3.3	33.3	-39.2	47.0	224.8	5000.0	-26.9
	V	49.7	*	3.3	33.3	-39.2	47.1	225.3	5000.0	-26.9
4637.50	H	49.5	*	3.6	34.6	-39.3	48.5	265.9	5000.0	-25.5
	V	50.3		3.6	34.6	-39.3	49.3	291.5	5000.0	-24.7
7420.00	H	49.5	*	4.7	35.7	-39.4	50.5	334.2	5000.0	-23.5
	V	49.4	*	4.7	35.7	-39.4	50.4	331.5	5000.0	-23.6
8347.50	H	49.7	*	4.9	35.8	-39.4	51.0	356.5	5000.0	-22.9
	V	49.9	*	4.9	35.8	-39.4	51.2	362.3	5000.0	-22.8

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	927.5MHz
Notes	Average Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	EUTy Cycle Factor (dB)	Average Total at 3m (dBµV/m)	Average Total at 3m (µV/m)	Average Limit at 3m (µV/m)	Margin (dB)
2782.50	H	41.33	*	2.8	32.9	-39.7	0.0	37.4	73.8	500.0	-16.6
	V	39.25	*	2.8	32.9	-39.7	0.0	35.3	58.1	500.0	-18.7
3710.00	H	38.13	*	3.3	33.3	-39.2	0.0	35.5	59.3	500.0	-18.5
	V	38.13	*	3.3	33.3	-39.2	0.0	35.5	59.3	500.0	-18.5
4637.50	H	38.82	*	3.6	34.6	-39.3	0.0	37.8	77.6	500.0	-16.2
	V	41.36		3.6	34.6	-39.3	0.0	40.3	103.9	500.0	-13.6
7420.00	H	37.76	*	4.7	35.7	-39.4	0.0	38.8	87.0	500.0	-15.2
	V	37.92	*	4.7	35.7	-39.4	0.0	38.9	88.6	500.0	-15.0
8347.50	H	38.08	*	4.9	35.8	-39.4	0.0	39.4	93.2	500.0	-14.6
	V	38.89	*	4.9	35.8	-39.4	0.0	40.2	102.3	500.0	-13.8

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	927.5MHz
Notes	Peak Measurements in Non-Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dB)
927.50	H	87.20		1.6	26.9	0.0	115.6	604039.7	NA	NA
	V	81.97		1.6	26.9	0.0	110.4	330800.0	NA	NA
1855.00	H	49.03		2.3	29.7	-40.0	41.0	112.5	60404.0	-54.6
	V	42.78		2.3	29.7	-40.0	34.8	54.8	60404.0	-60.9
5565.00	H	42.71		4.0	34.9	-39.4	42.2	129.5	60404.0	-53.4
	V	39.75		4.0	34.9	-39.4	39.3	92.1	60404.0	-56.3
6492.50	H	40.73		4.4	35.7	-39.4	41.4	117.1	60404.0	-54.3
	V	43.59		4.4	35.7	-39.4	44.2	162.8	60404.0	-51.4
9275.00	H	39.13	*	5.0	36.4	-39.3	41.2	115.2	60404.0	-54.4
	V	38.66	*	5.0	36.4	-39.3	40.8	109.1	60404.0	-54.9

26. Band-Edge Compliance

EUT Information	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On

Test Setup Details	
Setup Format	Tabletop
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Type of Antennas Used	Below 1GHz: Bilog (or equivalent)
Notes	None

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1

Procedure

1) Low Band Edge:
   a) The EUT was set up inside the test chamber on a non-conductive stand and a broadband measuring antenna was placed at a test distance of 3 meters from the EUT.
   b) The EUT was set to transmit continuously at the channel closest to the low band-edge.
   c) The EUT was maximized for worst case emissions at the measuring antenna and the maximum meter reading was recorded.
   d) To determine the band edge compliance, the following spectrum analyzer settings were used:
      - Center Frequency = 902MHz (low band-edge frequency).
      - Span = Wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation.
      - Resolution Bandwidth (RBW) = ≥ 1% of the span.
      - 'Max-Hold' function was engaged.
   e) The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.
   f) The marker was set on the peak of the in-band emissions. A display line was placed 20dB down from the peak of the in-band emissions. All emissions which fall outside of the authorized band of operation must be below the 20dB down display line. (All emissions to the left of the center frequency (band-edge) must be below the display line.)
   g) The analyzer's display was then screenshot and saved.
2) High Band Edge:
   a) The EUT was set up inside the test chamber on a non-conductive stand and a broadband measuring antenna was placed at a test distance of 3 meters from the EUT.

b) The EUT was set to transmit continuously at the channel closest to the high band-edge.

c) The EUT was maximized for worst case emissions at the measuring antenna and the maximum meter reading was recorded.

d) To determine the band edge compliance, the following spectrum analyzer settings were used:

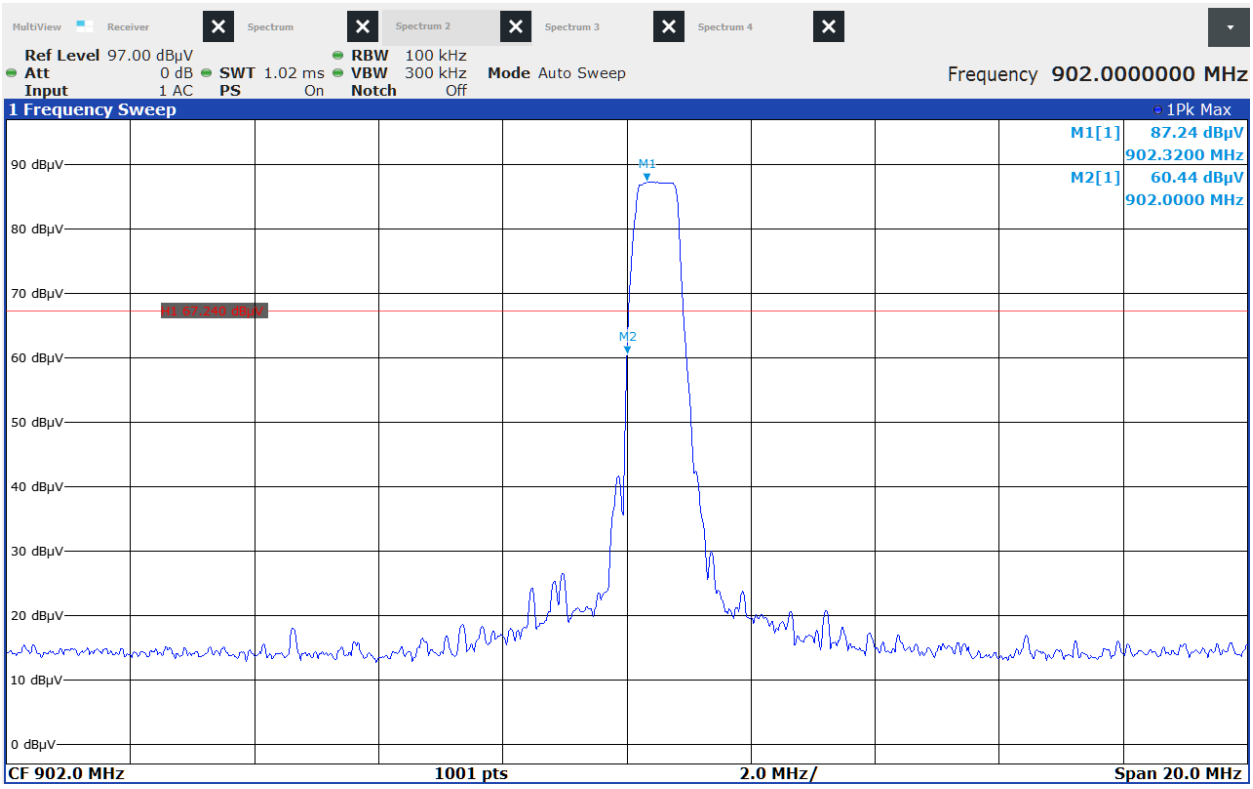
- Center Frequency = 928MHz (high band-edge frequency).
- Span = Wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation.
- Resolution Bandwidth (RBW) = ≥ 1% of the span.
- 'Max-Hold' function was engaged.

e) The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.

f) The marker was set on the peak of the in-band emissions. A display line was placed 20dB down from the peak of the in-band emissions. All emissions which fall outside of the authorized band of operation must be below the 20dB down display line. (All emissions to the left of the center frequency (band-edge) must be below the display line.)

g) The analyzer's display was then screenshot and saved.

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	902MHz
Notes	Low Band Edge

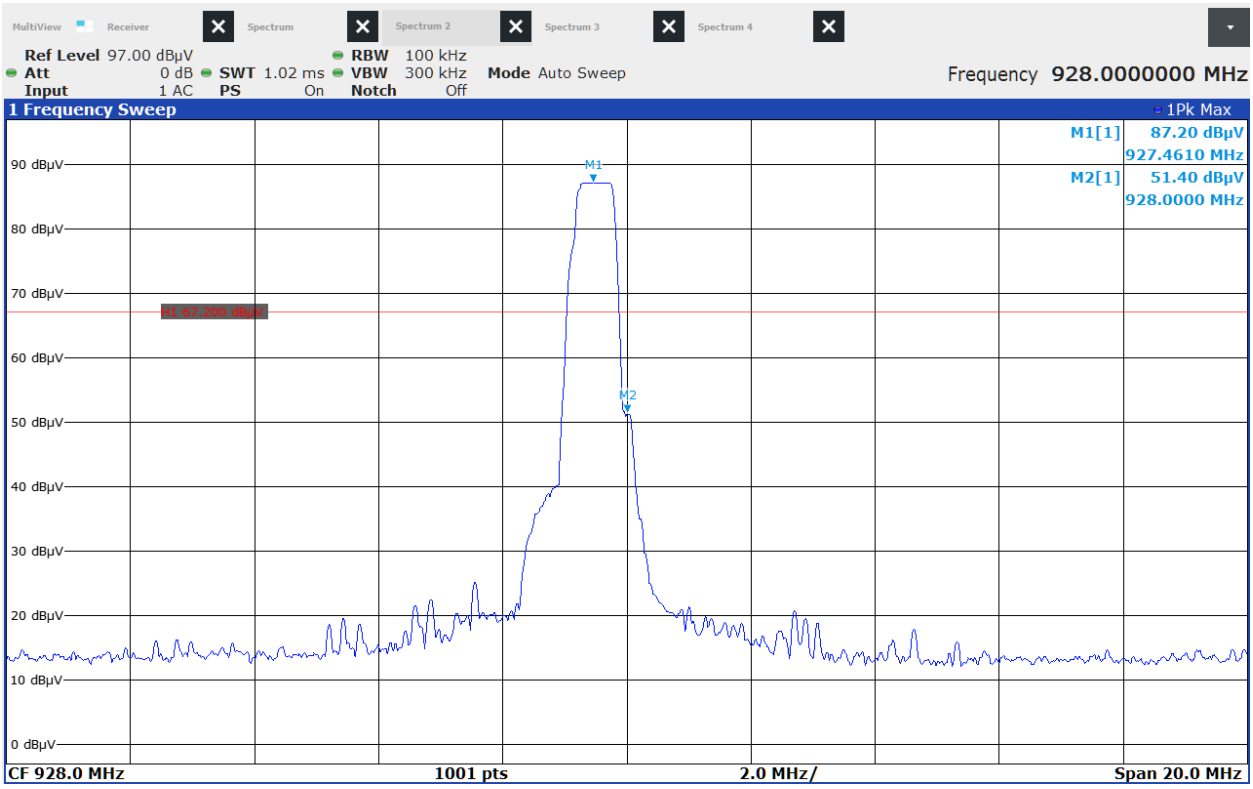


Band Edge Low

Manufacturer : Fastenal
Model Number : RN2903A
Serial Number : N/A
Mode : Low 902.5MHz
Parameters : Band Edge Low
Date : 12/4/2025 11:22:18 AM
Notes : None

TRACE1 : Function plot of Max Hold Peak

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	928MHz
Notes	High Band Edge



Band Edge High

Manufacturer : Fastenal
Model Number : RN2903A
Serial Number : N/A
Mode : High 927.5MHz
Parameters : Band Edge High
Date : 12/4/2025 11:38:49 AM
Notes : None

TRACE1 : Function plot of Max Hold Peak

27. Power Spectral Density

EUT Information	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On

Test Setup Details	
Setup Format	Tabletop
Measurement Method	Antenna Conducted
Type of Test Site	Elite Test Bench
Test Site Used	N/A
Type of Antennas Used	N/A
Notes	None

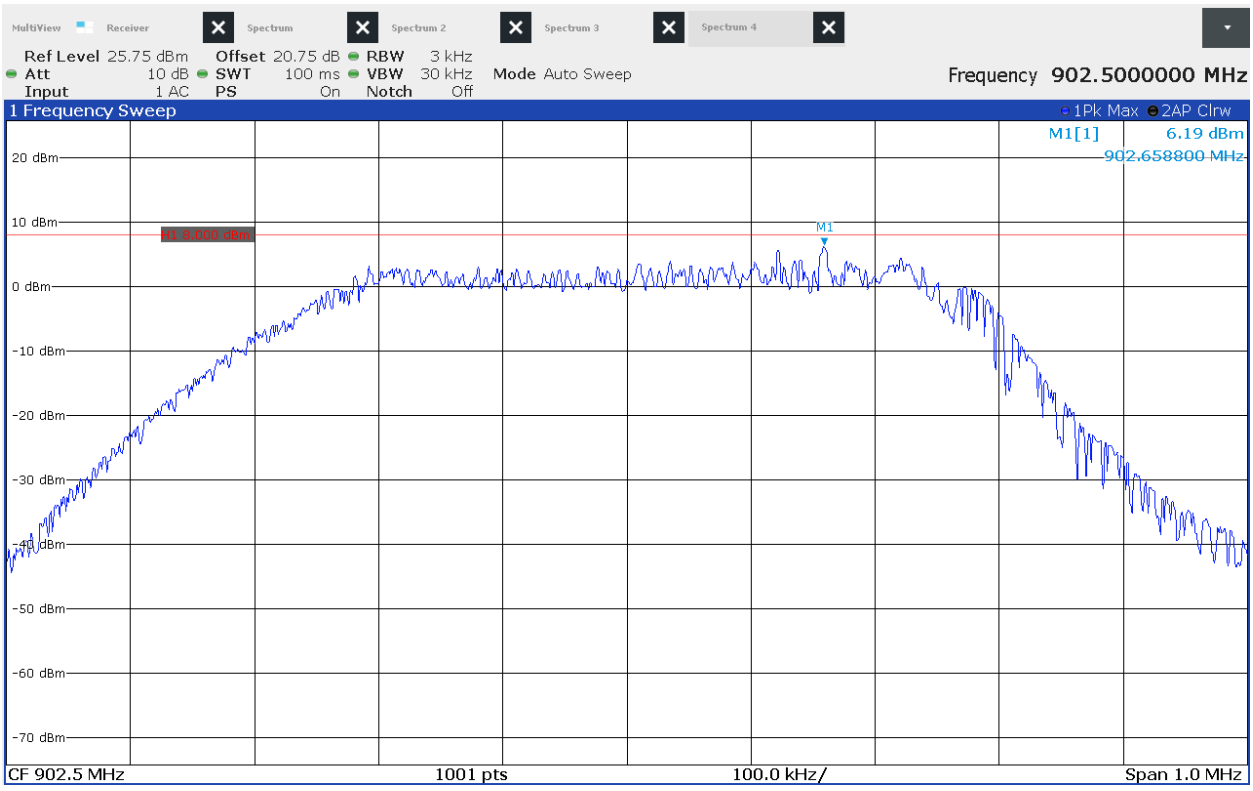
Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1

Requirement
The power spectral density from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

Procedure

1) The antenna port of the EUT was connected to the spectrum analyzer through a 20dB pad.
2) The EUT was then placed in normal operation mode.
3) To determine the power spectral density, the following spectrum analyzer settings were used:
    a) Center Frequency = Transmit Frequency
    b) Span = 1.5× the DTS (6dB) bandwidth
    c) Resolution Bandwidth (RBW) = 3kHz ≤ RBW ≤ 100kHz
    d) Sweep time = Auto
    e) Detector = Peak
    f) Trace Function = Max-Hold
4) A display line was then placed on the corresponding +8dBm level.
5) The analyzers display was then screenshot and saved.

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	902.5MHz
Result	PSD = 6.19dBm
Notes	None

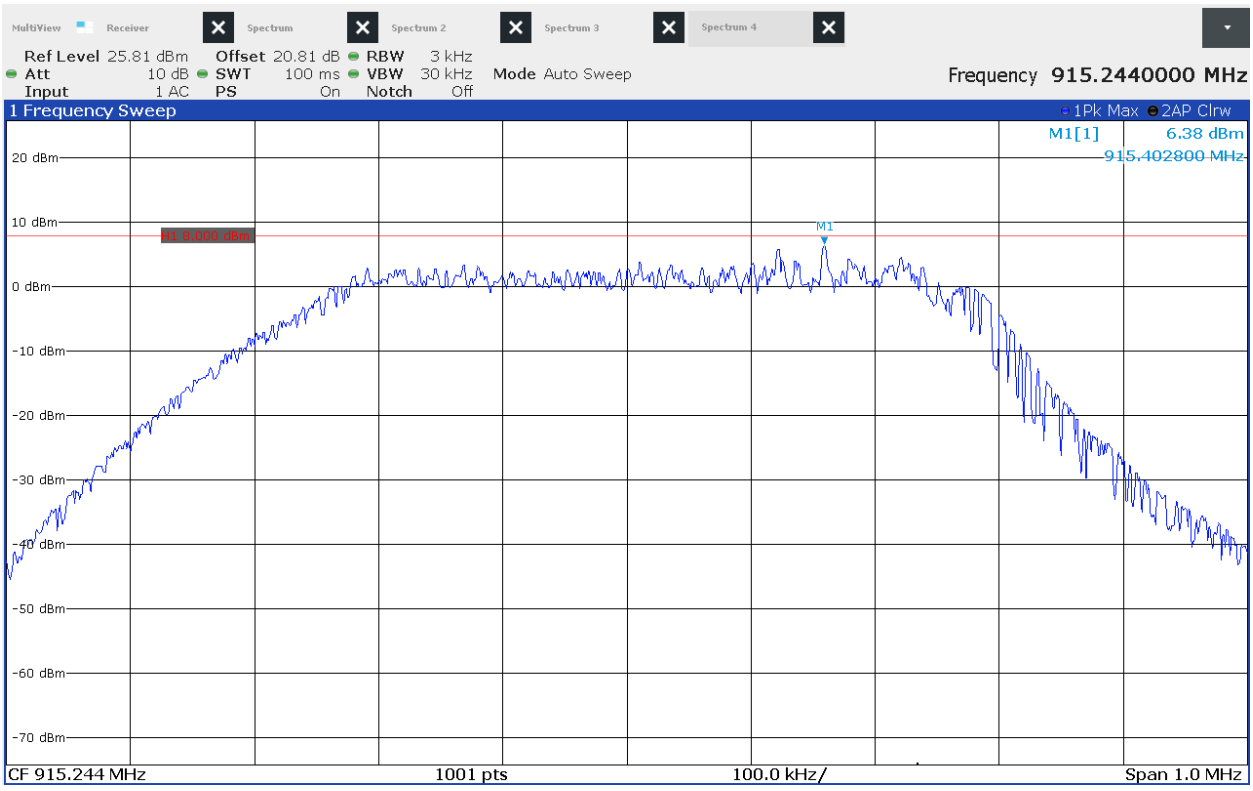


Power Spectral Density

Manufacturer : Fastenal
Model Number : RN2903A
Serial Number :
Mode : Low 902.5MHz
Parameters :
Date : 12/3/2025 10:53:32 AM
Notes :

TRACE1 : Function plot of Max Hold Peak
TRACE2 : Normal Peak (dBm) Trace

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	915.244MHz
Result	PSD = 6.38dBm
Notes	None

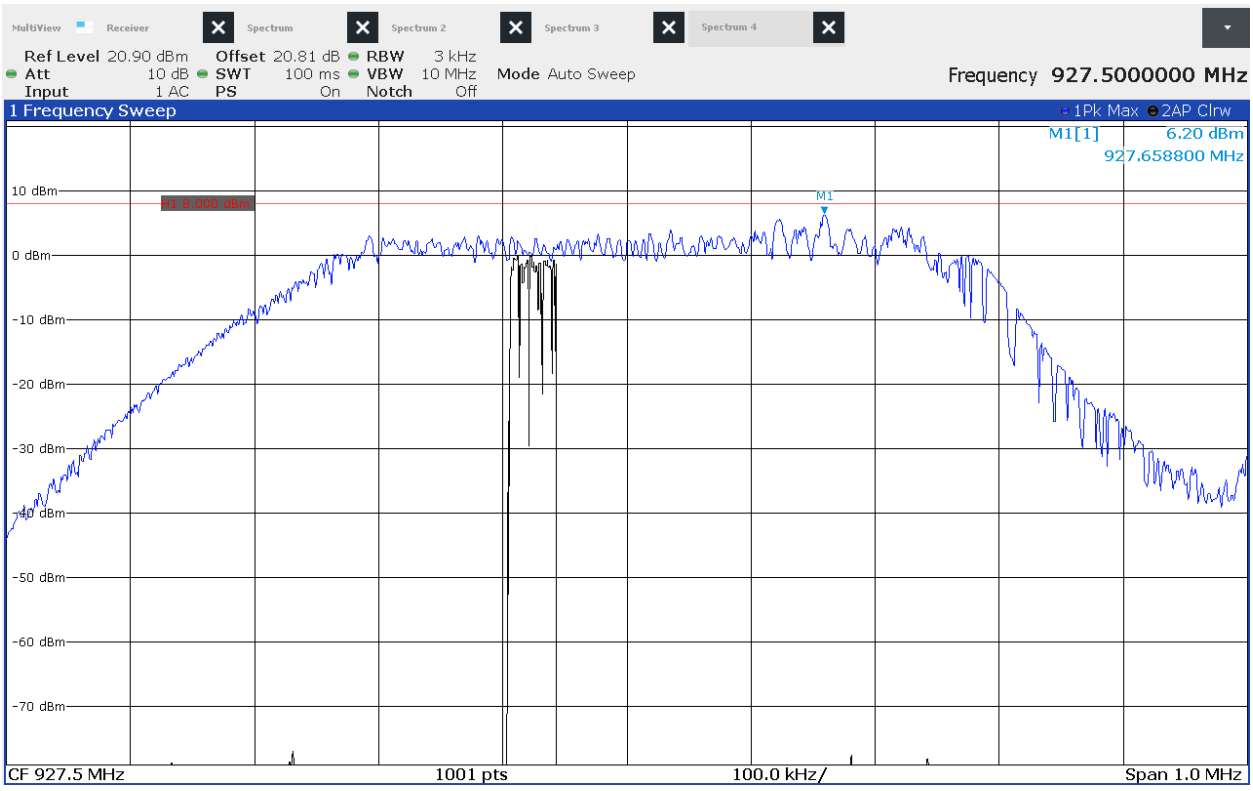


Power Spectral Density

Manufacturer : Fastenal
Model Number : RN2903A
Serial Number :
Mode : Mid 915.244MHz
Parameters :
Date : 12/3/2025 1:03:22 PM
Notes :

TRACE1 : Function plot of Max Hold Peak
TRACE2 : Normal Peak (dBm) Trace

Test Details	
Manufacturer	Fastenal Company
EUT	LoRa Module
Model No.	RN2903A
Serial No.	N/A
Mode	Tx On
Frequency Tested	927.5MHz
Result	PSD = 6.2dBm
Notes	None



Power Spectral Density

Manufacturer : Fastenal
Model Number : RN2903A
Serial Number :
Mode : High 927.5MHz
Parameters :
Date : 12/3/2025 1:12:34 PM
Notes :

TRACE1 : Function plot of Max Hold Peak
TRACE2 : Normal Peak (dBm) Trace

28. Scope of Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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ELECTRICAL

Valid To: June 30, 2027 Certificate Number: 1786.01

In recognition of the successful completion of the A2LA Accreditation Program evaluation process, accreditation is granted to this laboratory at the location listed above, as well as the satellite location listed below, to perform the following automotive electromagnetic compatibility and other electrical tests:

Test Technology:	**Test Method(s)[1]:**
Transient Immunity *(Max Voltage 1500 V/Max current 1000 A)*	ISO 7637-2 (including emissions); ISO 7637-3; ISO 7637-4; ISO 16750-2, Sections 4.6.3 and 4.6.4; ISO 21498-1; ISO 21498-2; CS.00054, Section 5.9; CS.00244 Section 5.2.15 through 5.2.21; CS.00245; CS.00246 Section 5.2.4; EMC-CS-2009.1 (CI220); FMC1278 (CI220, CI221, CI222); GMW 3097, Section 3.5; SAE J1113-11; SAE J1113-12; ECE Regulation 10.06 Annex 10
Electrostatic Discharge (ESD) *(Up to +/-25 kV)*	ISO 10605 (2001, 2008); ISO 10605; CS.00054, Section 5.10; CS.00244 Section 5.5; EMC-CS-2009.1 (CI 280); FMC1278 (CI280); SAE J1113-13; GMW 3097 Section 3.6
Conducted Emissions	CISPR 25 (2002, 2008), Sections 6.2 and 6.3; CISPR 25 (2016), Sections 6.3 and 6.4; CISPR 25; CS.00054, Sections 5.6.1 and 5.6.2; CS.00244 Sections 5.4.2 and 5.4.3; GMW 3097, Section 3.3.2; EMC-CS-2009.1 (CE 420); FMC1278 (CE420, CE421, CE 430, CE440)

Test Technology:	Test Method(s)[1]:
Radiated Emissions Anechoic *(Up to 6 GHz)*	CISPR 25 (2002, 2008), Section 6.4; CISPR 25 (2016), Section 6.5; CISPR 25; CS.00054, Section 5.6.3; CS.00244 Section 5.4.4; GMW 3097, Section 3.3.1; EMC-CS-2009.1 (RE 310); FMC1278 (RE310, RE320)
Vehicle Radiated Emissions	CISPR 12; CISPR 36; ICES-002; ECE Regulation 10.06 Annex 4; ECE Regulation 10.06 Annex 5
Bulk Current Injection (BCI) *(1 to 400MHz 500mA)*	ISO 11452-4; CS.00054, Section 5.8.1; CS.00244 Section 5.3.2; GMW 3097, Section 3.4.1; SAE J1113-4; EMC-CS-2009.1 (RI112); FMC1278 (RI112); ECE Regulation 10.06 Annex 9
Radiated Immunity Anechoic *(Up to 6GHz and 200V/m)* *(Including Radar Pulse 600V/m)*	ISO 11452-2; CS.00054, Section 5.8.2; CS.00244 Section 5.3.3; GMW 3097, Section 3.4.2; EMC-CS-2009.1 (RI114); FMC1278 (RI114); SAE J1113-21; ECE Regulation 10.06 Annex 9
Radiated Immunity Magnetic Field	ISO 11452-8; FMC 1278 (RI140); CS.00244 Section 5.3.4
Radiated Immunity Reverb *(360MHz to 6GHz and 100V/m)*	ISO/IEC 61000-4-21; GMW 3097, Section 3.4.3; EMC-CS-2009.1 (RI114); FMC1278 (RI114); ISO 11452-11
Radiated Immunity *(Portable Transmitters)* *(Up to 6GHz and 20W)*	ISO 11452-9; CS.00244 Section 5.3.5; EMC-CS-2009.1 (RI115); FMC1278 (RI115); GMW 3097, Sec 3.4.4
Vehicle Radiated Immunity (ALSE)	ISO 11451-2; ECE Regulation 10.06 Annex 6
Vehicle Product Specific EMC Standards	EN 14982; EN ISO 13309; ISO 13766; EN 50498; EC Regulation No. 2015/208; EN 55012
Electrical Loads	ISO 16750-2
Stripline	ISO 11452-5
Emissions Radiated and Conducted (3m Semi-anechoic chamber, up to 40 GHz)	47 CFR, FCC Part 15 B (using ANSI C63.4:2014); 47 CFR, FCC Part 18 (using FCC MP-5:1986); ICES-001; ICES-003; ICES-005; IEC/CISPR 11, Ed. 4.1 (2004-06); AS/NZS CISPR 11 (2004); IEC/CISPR 11 Ed 5 (2009-05) + A1 (2010); KN 11 (2008-5) with RRL Notice No. 2008-3 (May 20, 2008); CISPR 11; EN 55011; KS C 9811; CNS 13803 (1997, 2003); CISPR 14-1; EN 55014-1; AS/NZS CISPR 14.1;

Test Technology:	Test Method(s)[1]:
Radiated and Conducted (cont'd) (*3m Semi-anechoic chamber, up to 40 GHz*)	CISPR 16-2-1 (2008); CISPR 16-2-1; KS C 9814-1; KN 14-1; IEC/CISPR 22 (1997); EN 55022 (1998) + A1(2000); EN 55022 (1998) + A1(2000) + A2(2003); EN 55022 (2006); IEC/CISPR 22 (2008-09); AS/NZS CISPR 22 (2004); AS/NZS CISPR 22, 3rd Edition (2006); KN 22 (up to 6 GHz); CNS 13438 (up to 6 GHz); VCCI V-3 (up to 6 GHz); CISPR 32; EN 55032; KS C 9832; KN 32; ECE Regulation 10.06 Annex 7 (Broadband); ECE Regulation 10.06 Annex 8 (Narrowband); ECE Regulation 10.06 Annex 13 (Conducted); ECE Regulation 10.06 Annex 14 (Conducted)
Cellular Radiated Spurious Emissions	ETSI TS 151 010-1 GSM; 3GPP TS 51.010-1, Sec 12; ETSI TS 134 124 UMTS; 3GPP TS 34.124; ETSI TS 136 124 LTE; E-UTRA; 3GPP TS 36.124
Current Harmonics	IEC 61000-3-2; IEC 61000-3-12; EN 61000-3-2; KN 61000-3-2; KS C 9610-3-2; ECE Regulation 10.06 Annex 11
Flicker and Fluctuations	IEC 61000-3-3; IEC 61000-3-11; EN 61000-3-3; KN 61000-3-3; KS C 9610-3-3; ECE Regulation 10.06 Annex 12
Immunity Electrostatic Discharge	IEC 61000-4-2, Ed. 1.2 (2001); IEC 61000-4-2 (1995) + A1(1998) + A2(2000); EN 61000-4-2 (1995); EN 61000-4-2 (2009-05); KN 61000-4-2 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-2; EN 61000-4-2; KN 61000-4-2; KS C 9610-4-2; IEEE C37.90.3 2001
Radiated Immunity	IEC 61000-4-3 (1995) + A1(1998) + A2(2000); IEC 61000-4-3, Ed. 3.0 (2006-02); IEC 61000-4-3, Ed. 3.2 (2010); KN 61000-4-3 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-3; EN 61000-4-3; KN 61000-4-3; KS C 9610-4-3; IEEE C37.90.2 2004
Electrical Fast Transient/Burst	IEC 61000-4-4, Ed. 2.0 (2004-07); IEC 61000-4-4, Ed. 2.1 (2011); IEC 61000-4-4 (1995) + A1(2000) + A2(2001); KN 61000-4-4 (2008-5); RRL Notice No. 2008-5 (May 20, 2008); IEC 61000-4-4; EN 61000-4-4; KN 61000-4-4; KS C 9610-4-4; ECE Regulation 10.06 Annex 15

Test Technology:	Test Method(s)[1]:
Surge	IEC 61000-4-5 (1995) + A1(2000); IEC 61000-4-5, Ed 1.1 (2005-11); EN 61000-4-5 (1995) + A1(2001); KN 61000-4-5 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-5; EN 61000-4-5; KN 61000-4-5; KS C 9610-4-5; IEEE C37.90.1 2012; IEEE STD C62.41.2 2002; ECE Regulation 10.06 Annex 16
Conducted Immunity	IEC 61000-4-6 (1996) + A1(2000); IEC 61000-4-6, Ed 2.0 (2006-05); IEC 61000-4-6 Ed. 3.0 (2008); KN 61000-4-6 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); EN 61000-4-6 (1996) + A1(2001); IEC 61000-4-6; EN 61000-4-6; KN 61000-4-6; KS C 9610-4-6
Power Frequency Magnetic Field Immunity (*Down to 3 A/m*)	IEC 61000-4-8 (1993) + A1(2000); IEC 61000-4-8 (2009); EN 61000-4-8 (1994) + A1(2000); KN 61000-4-8 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-8; EN 61000-4-8; KN 61000-4-8; KS C 9610-4-8
Voltage Dips, Short Interrupts, and Line Voltage Variations	IEC 61000-4-11, Ed. 2 (2004-03); KN 61000-4-11 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-11; EN 61000-4-11; KN 61000-4-11; KS C 9610-4-11
Ring Wave	IEC 61000-4-12, Ed. 2 (2006-09); EN 61000-4-12:2006; IEC 61000-4-12; EN 61000-4-12; KN 61000-4-12; IEEE STD C62.41.2 2002
Generic and Product Specific EMC Standards	IEC/EN 61000-6-1; AS/NZS 61000-6-1; KN 61000-6-1; KS C 9610-6-1; IEC/EN 61000-6-2; AS/NZS 61000-6-2; KN 61000-6-2; KS C 9610-6-2; IEC/EN 61000-6-3; AS/NZS 61000-6-3; KN 61000-6-3; KS C 9610-6-3; IEC/EN 61000-6-4; AS/NZS 61000-6-4; KN 61000-6-4; KS C 9610-6-4; EN 50130-4; EN 61326-1; EN 50121-3-2; EN 12895; EN 50270; EN 50491-1; EN 50491-2; EN 50491-3; EN 55015; EN 60730-1; EN 60945; IEC 60533; EN 61326-2-6; EN 61800-3; IEC/CISPR 14-2; EN 55014-2; AS/NZS CISPR 14.2; KN 14-2; KS C 9814-2; IEC/CISPR 24; AS/NZS CISPR 24; EN 55024; KN 24; IEC/CISPR 35; AS/NZS CISPR 35; EN 55035; KN 35; KS C 9835; IEC 60601-1-2; JIS T0601-1-2; ANSI C63.27

Test Technology:	Test Method(s)[1]:
TxRx EMC Requirements	EN 301 489-1; EN 301 489-3; EN 301 489-9; EN 301 489-17; EN 301 489-19; EN 301 489-20
European Radio Test Standards	ETSI EN 300 086-1; ETSI EN 300 086-2; ETSI EN 300 113-1; ETSI EN 300 113-2; ETSI EN 300 220-1; ETSI EN 300 220-2; ETSI EN 300 220-3-1; ETSI EN 300 220-3-2; ETSI EN 300 330-1; ETSI EN 300 330-2; ETSI EN 300 440-1; ETSI EN 300 440-2; ETSI EN 300 422-1; ETSI EN 300 422-2; ETSI EN 300 328; ETSI EN 301 893; ETSI EN 301 511; ETSI EN 301 908-1; ETSI EN 908-2; ETSI EN 908-13; ETSI EN 303 413; ETSI EN 302 502; EN 303 340; EN 303 345-2; EN 303 345-3; EN 303 345-4
Canadian Radio Tests	RSS-102; RSS-102.NS.MEAS; SPR-002; RSS-111; RSS-112; RSS-117; RSS-119; RSS-123; RSS-125; RSS-127; RSS-130; RSS-131; RSS-132; RSS-133; RSS-134; RSS-135; RSS-137; RSS-139; RSS-140; RSS-141; RSS-142; RSS-170; RSS-181; RSS-182; RSS-192; RSS-194; RSS-195; RSS-196; RSS-197; RSS-198; RSS-199; RSS-210 *(up to 40 GHz)*; RSS-211*(up to 40 GHz)*; RSS-213; RSS-215; RSS-216 *(up to 40 GHz)*; RSS-220 *(up to 40 GHz)*; RSS-222; RSS-236; RSS-238; RSS-243; RSS-244; RSS-247; RSS-248; RSS-252; RSS-287; RSS-288; RSS-310; RSS-GEN
Mexico Radio Tests	IFT-008-2015; NOM-208-SCFI-2016
Japan Radio Tests	Radio Law No. 131, Ordinance of MPT No. 37, 1981, MIC Notification No. 88:2004, Table No. 22-11; ARIB STD-T66, Regulation 18
Taiwan Radio Tests	LP-0002 (February 6, 2024)
Australia/New Zealand Radio Tests	AS/NZS 4268; Radiocommunications (Short Range Devices) Standard (2014)
Hong Kong Radio Tests	HKCA 1039 Issue 6; HKCA 1042; HKCA 1033 Issue 7; HKCA 1061; HKCA 1008; HKCA 1043; HKCA 1057; HKCA 1073
Korean Radio Test Standards	KN 301 489-1; KN 301 489-3; KN 301 489-9; KN 301 489-17; KN 301 489-52; KS X 3124; KS X 3125; KS X 3130; KS X 3126; KS X 3129
Vietnam Radio Test Standards	QCVN 47:2015/BTTTT; QCVN 54:2020/BTTTT; QCVN 55:2011/BTTTT; QCVN 65:2013/BTTTT; QCVN 73:2013/BTTTT; QCVN 74:2020/BTTTT; QCVN 112:2017/BTTTT; QCVN 117:2020//BTTTT

Test Technology:	Test Method(s)[1]:
Vietnam EMC Test Standards	QCVN 18:2014/BTTTT; QCVN 86:2019/BTTTT; QCVN 96:2015/BTTTT; QCVN 118:2018/BTTTT
Unlicensed Radio Frequency Devices *(3 Meter Semi-Anechoic Room)*	47 CFR FCC Part 15C, 15D, 15E, 15F, 15G, 15H (using ANSI C63.10:2020, ANSI C63.17:2013 and FCC KDB 905462 D02 (v02))
Licensed Radio Service Equipment	47 CFR FCC Parts 20, 22, 24, 25, 27, 30, 73, 74, 80, 87, 90, 95, 96, 97, 101 (using ANSI/TIA-603-E, TIA-102.CAAA-E, ANSI C63.26:2015); ANSI/TIA-603-F
OTA (Over the Air) Performance GSM, GPRS, EGPRS UMTS (W-CDMA) LTE Cat 0+, M1, NB1 A-GNSS for UMTS/GSM, LTE Large Device/Laptop/Tablet Testing Integrated Device Testing WiFi 802.11 a/b/g/n/ac	CTIA Test Plan for Wireless Device Over-the-Air Performance (Method for Measurement for Radiated Power and Receiver Performance) V6.0[2]; CTIA Test Plan for RF Performance Evaluation of WiFi Mobile Converged Devices V4.0[2]
Electrical Measurements and Simulation AC Voltage / Current (1mV to 5kV) 60 Hz (0.1V to 250V) up to 500 MHz (1µA to 150A) 60 Hz DC Voltage / Current (1mV to 15 kV) / (1µA to 10A) Power Factor / Efficiency / Crest Factor (Power to 30kW) Resistance (1mΩ to 4000MΩ) Surge (Up to 10 kV / 5 kA) (Combination Wave and Ring Wave)	FAA AC 150/5345-10; FAA AC 150/5345-43; FAA AC 150/5345-44; FAA AC 150/5345-46; FAA AC 150/5345-47; FAA EB 67