



Radiantum

WIRELESS PERFORMANCE MATTERS

P3241 TWTG
LoRa Measurements and Tuning
Measurement Summary
10/05/2023
Matti Lahdenperä

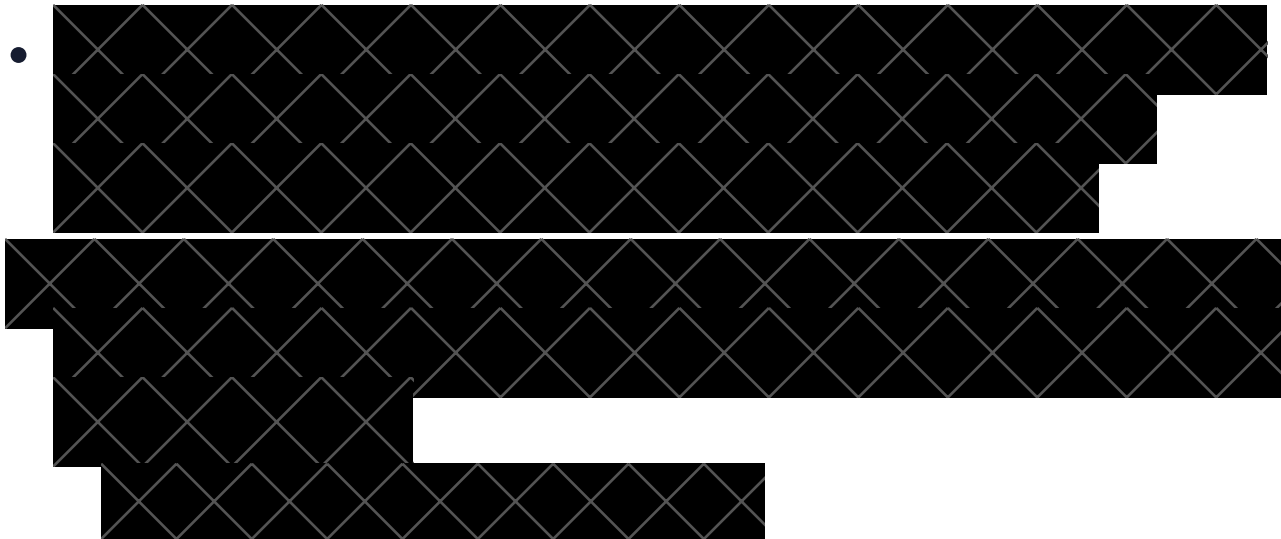
SUMMARY 1

- Tested deviceS: Neon Vibration Sensor
[REDACTED]
 - DS-LD-02-00
- Tested antennas:
 - Ignion NNO2-224, LoRa 868&915 MHz bands
- Comparing Total Radiated Power (TRP) of 02-00 device to 01-01 device. 02-00 has better performance on 868MHz band and similar or slightly better performance on 915MHz band
- No extra resonances were found
- No spurious emissions were found



SUMMARY 2

- Original antenna matching is good but slightly favours the 868MHz band
 - New matching was done to improve antenna performance on 915MHz band

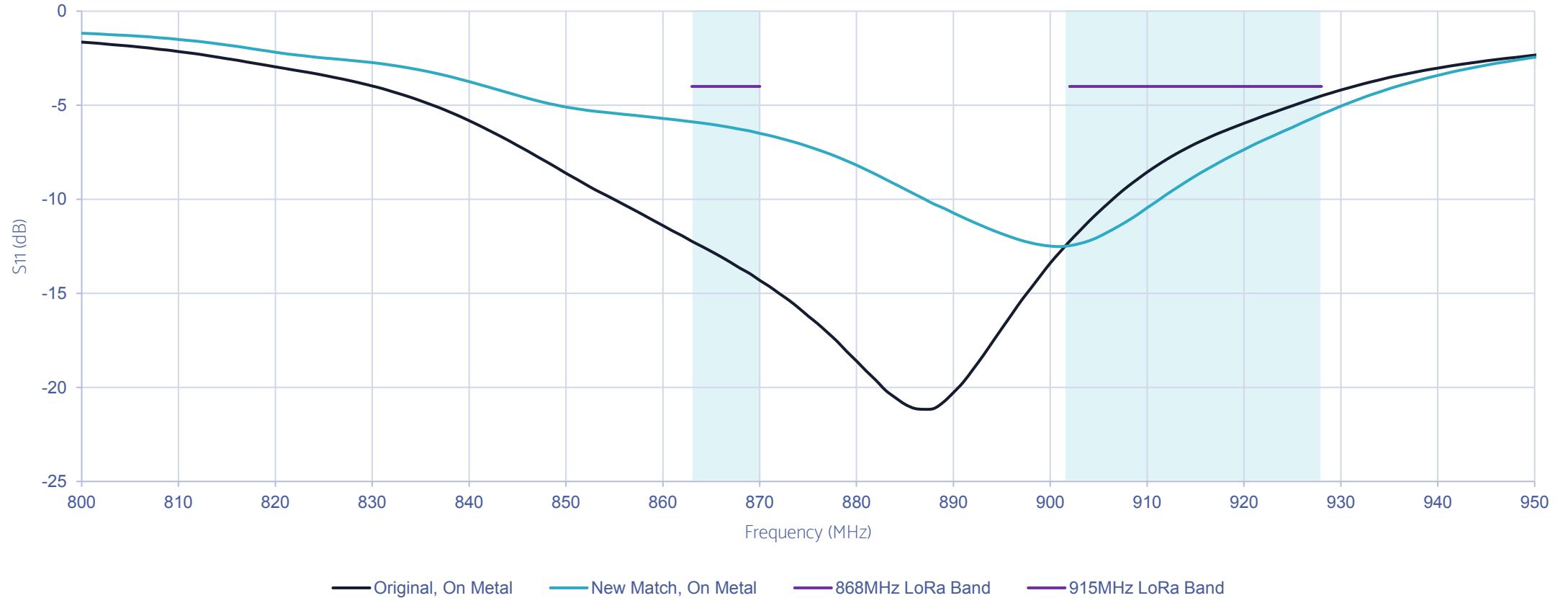




TRP/EIRP/GAIN

	868MHz		915MHz		923MHz	
	Free Space TRP (dBm)	On metal TRP (dBm)	Free Space TRP (dBm)	On metal TRP (dBm)	Free Space TRP (dBm)	On metal TRP (dBm)
TRP						
DS-LD-02-00, Original Antenna Matching	8.4	6.3	4.9	2.4	3.7	1.8
EIRP						
DS-LD-02-00, Original Antenna Matching	12.3	10.8	8.5	6.8	6.8	6.3
Gain						
DS-LD-02-00, Original Antenna Matching	-4.7	-4.9	-3.0	-5.0	-3.5	-5.6

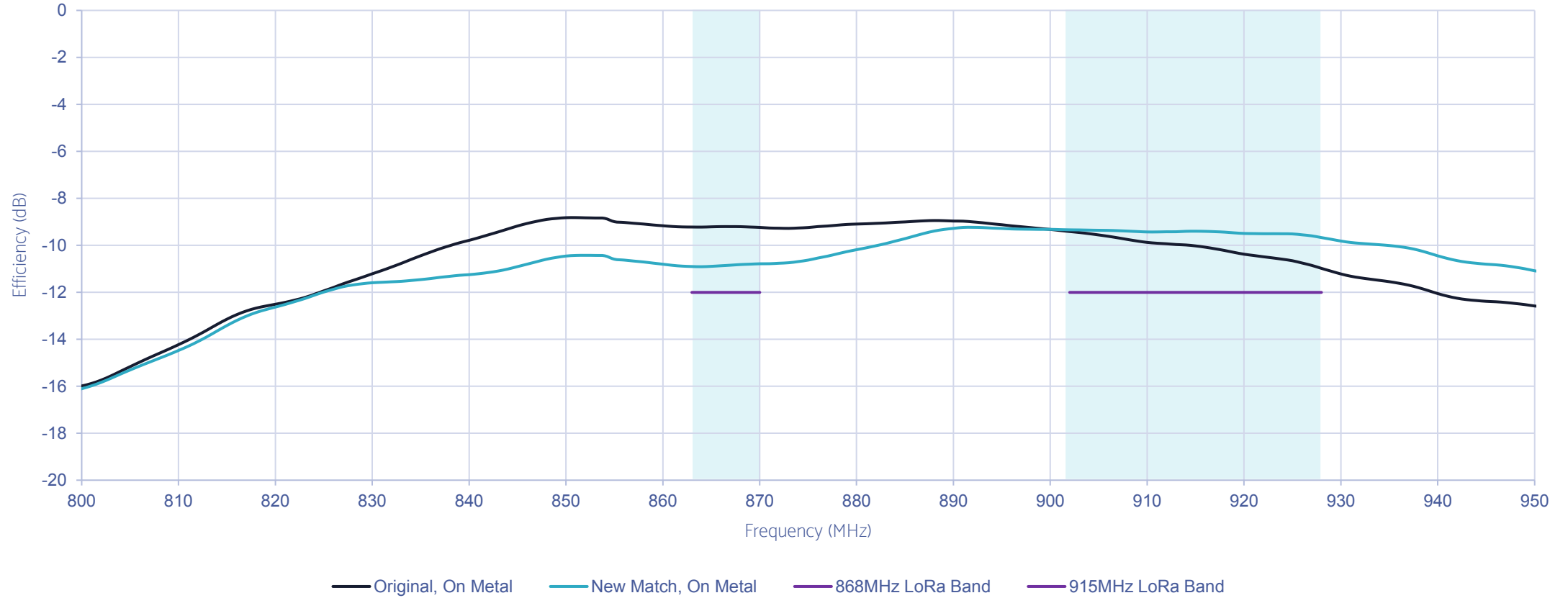
MEASURED ANTENNA S-PARAMETERS



Shown: 868&915MHz LoRa Bands

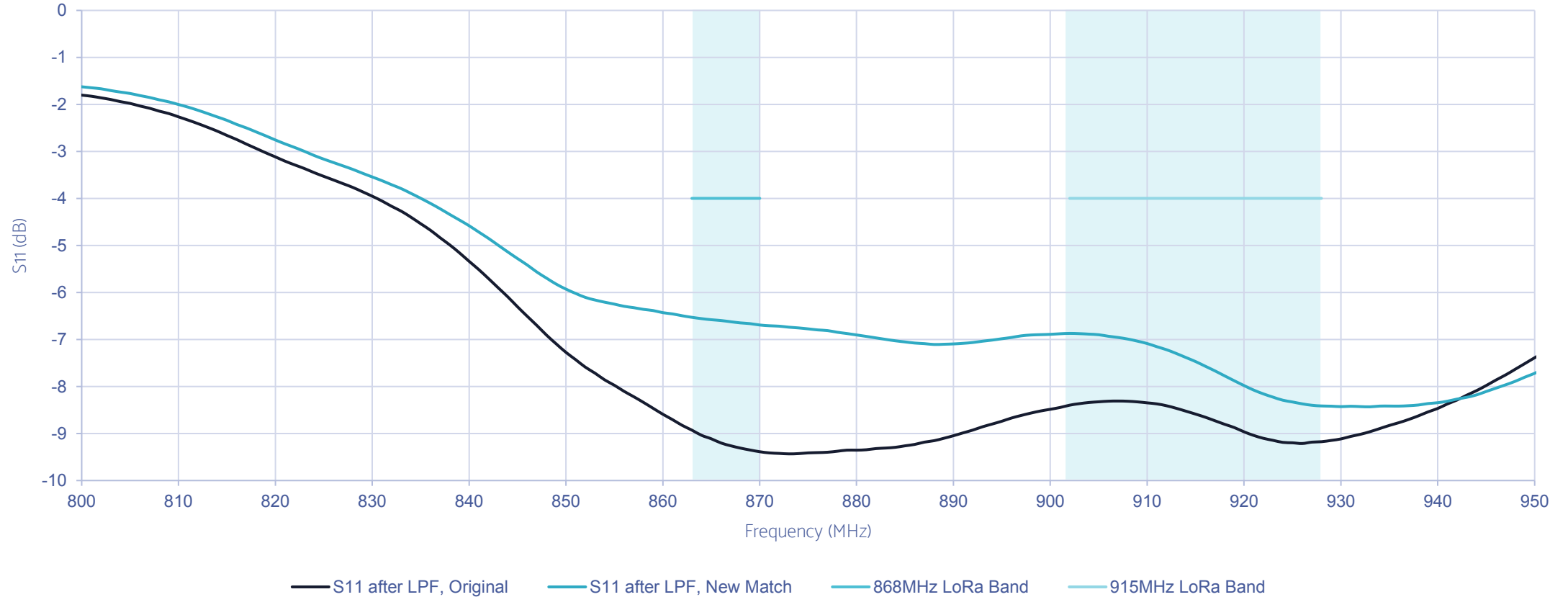


MEASURED ANTENNA EFFICIENCY



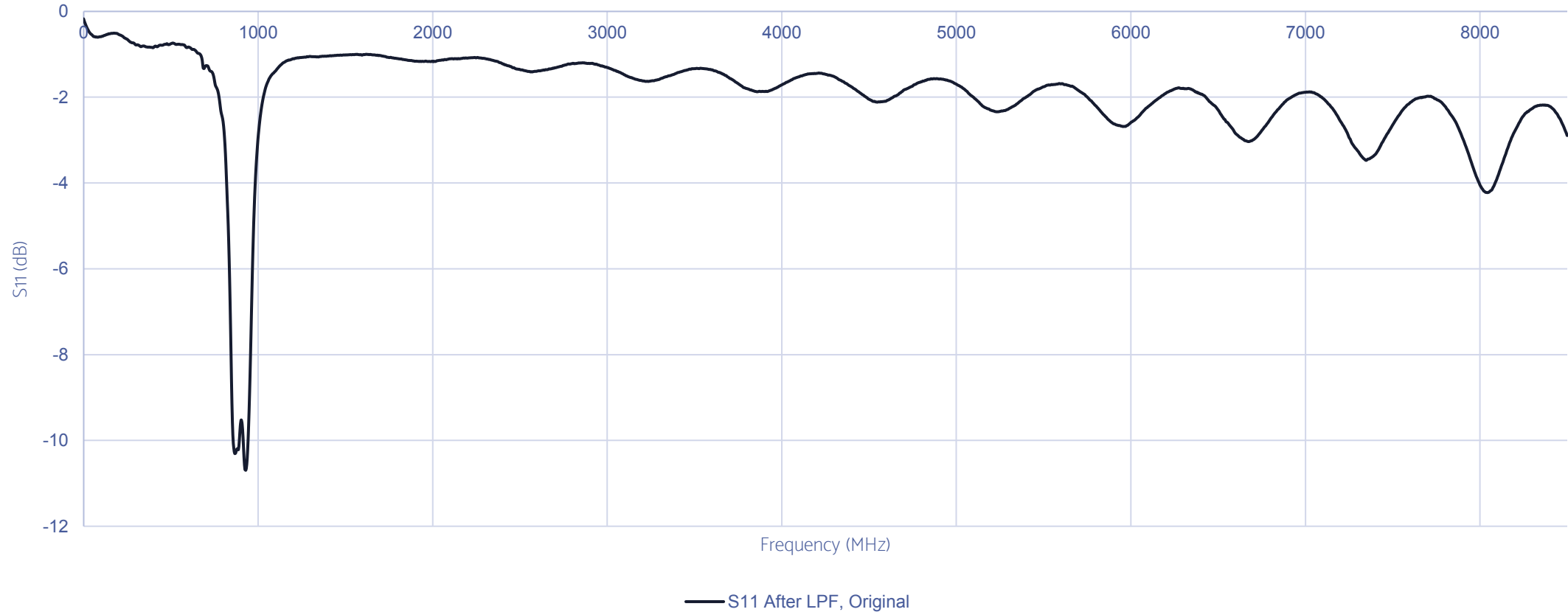
Shown: 868&915MHz LoRa Bands

MEASURED S11 WITH LPF ON METAL



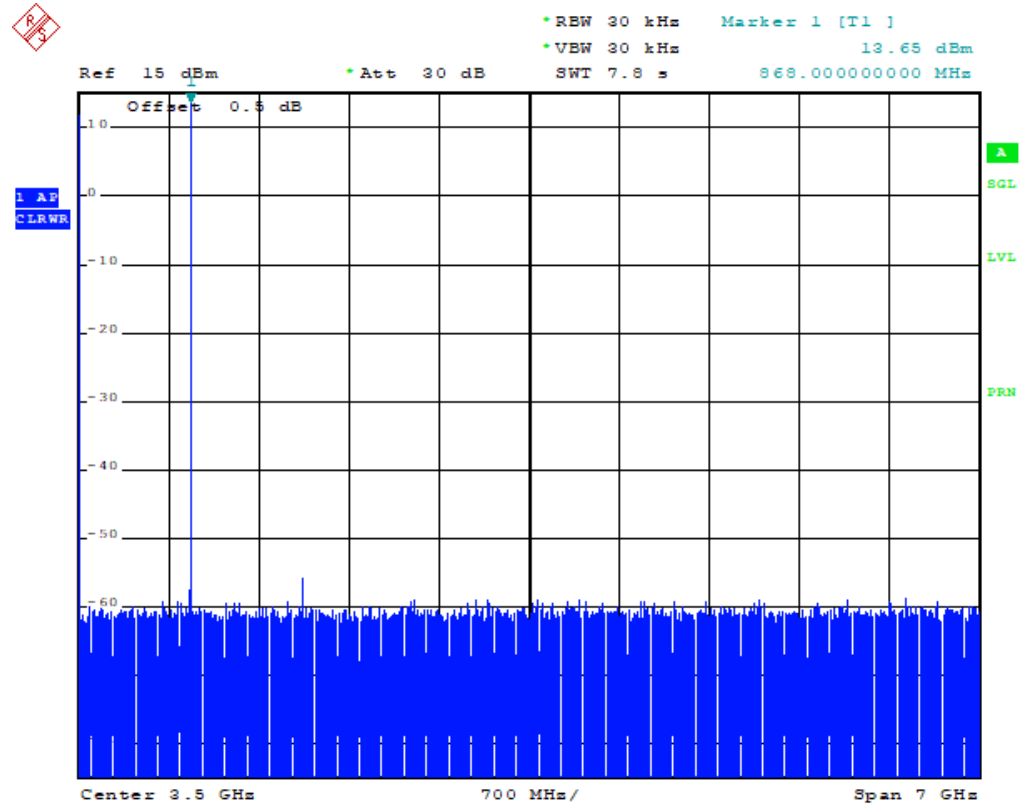
Shown: 868&915MHz LoRa Bands

MEASURED S11 WITH LPF ON METAL – FULL RANGE

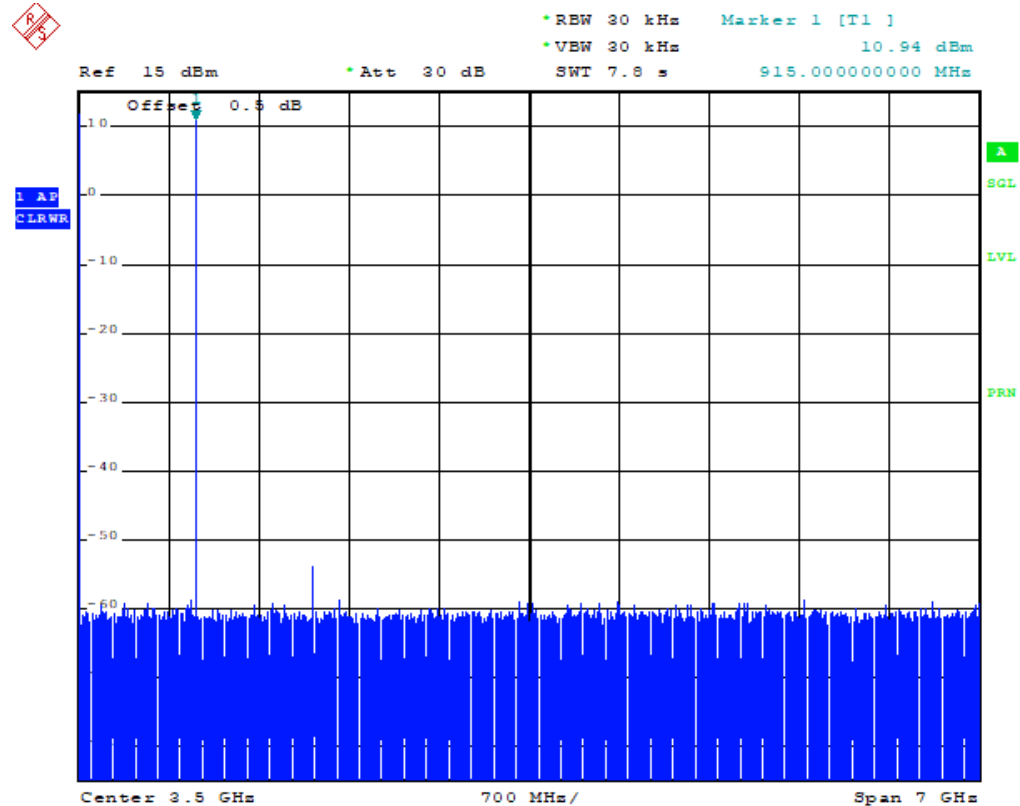


Ripple effect comes from measurement cables

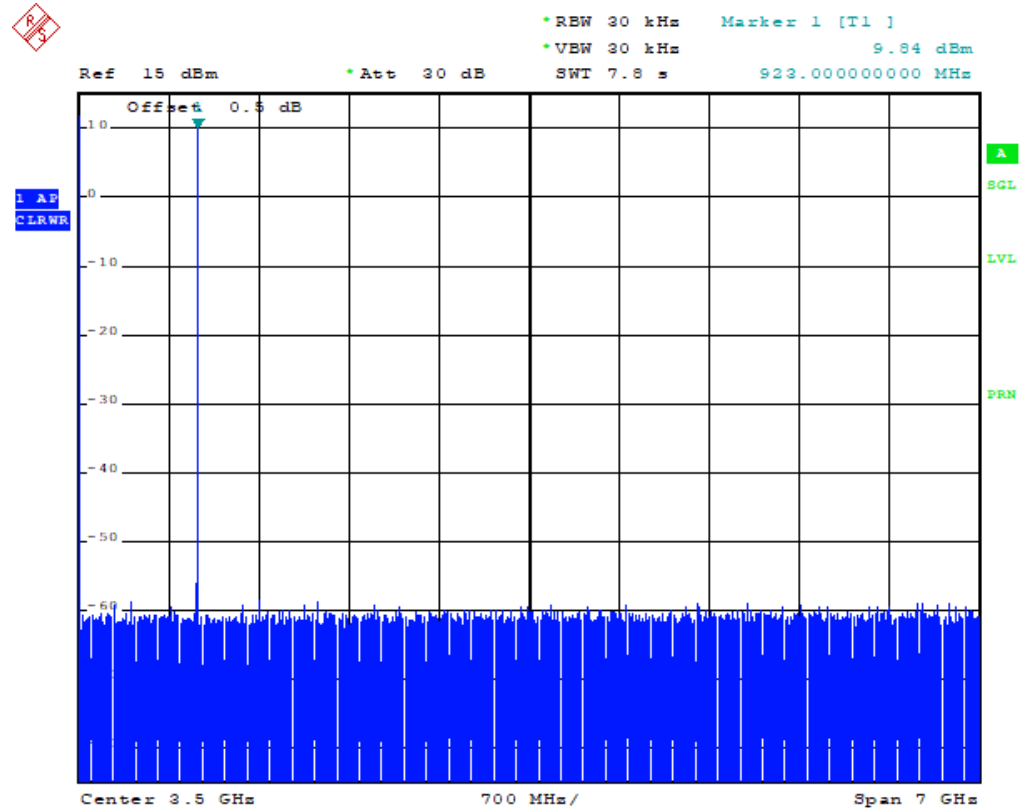
SPURIOUS EMISSIONS 868MHz



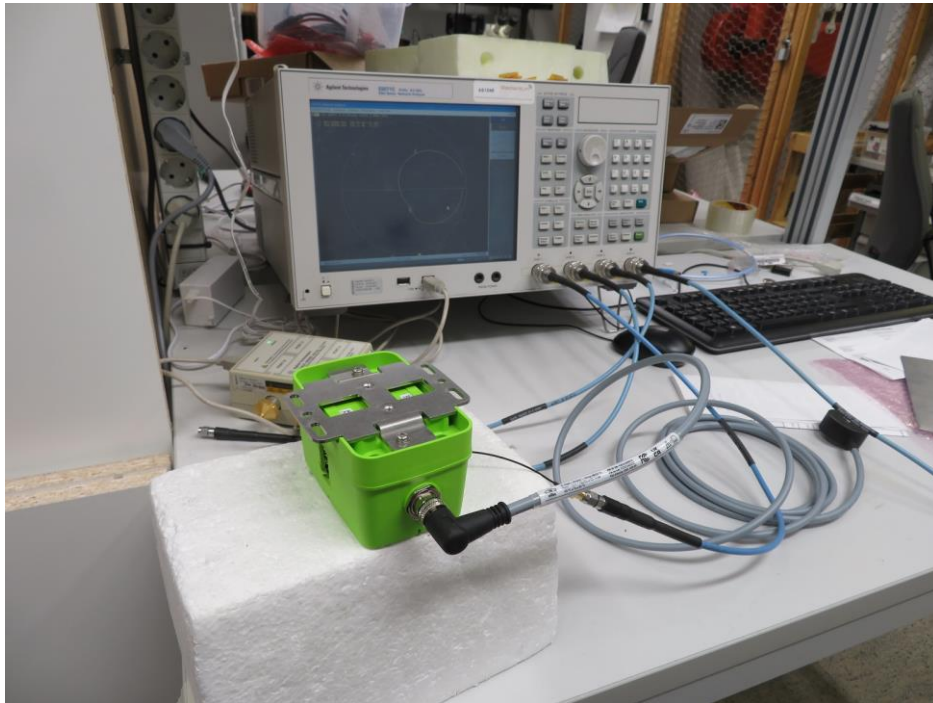
SPURIOUS EMISSIONS 915MHz



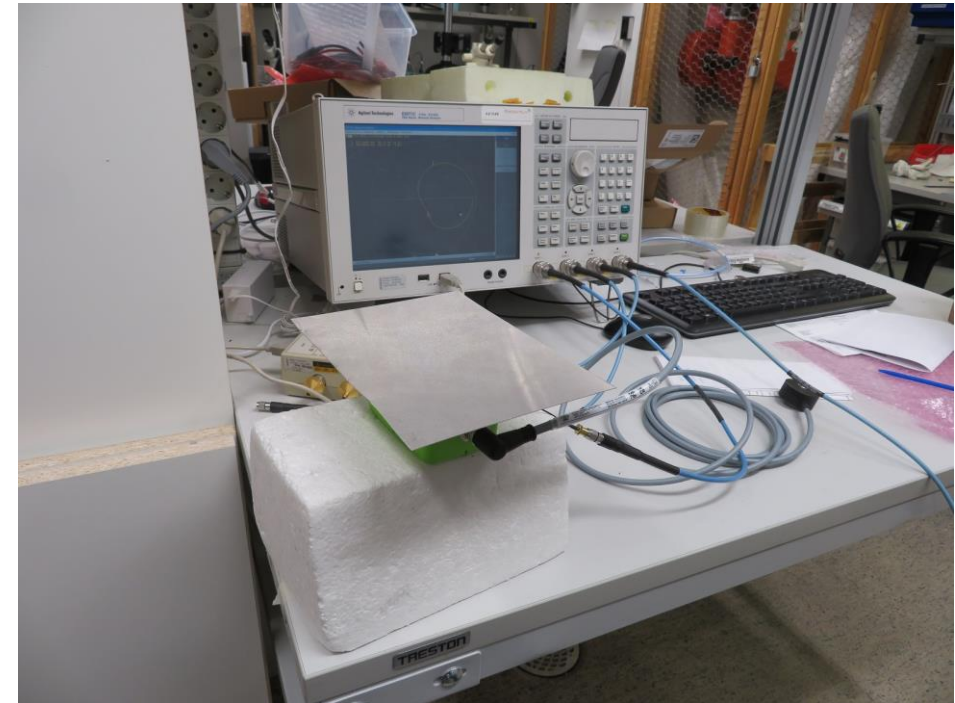
SPURIOUS EMISSIONS 923MHz



S11 MEASURING SETUP

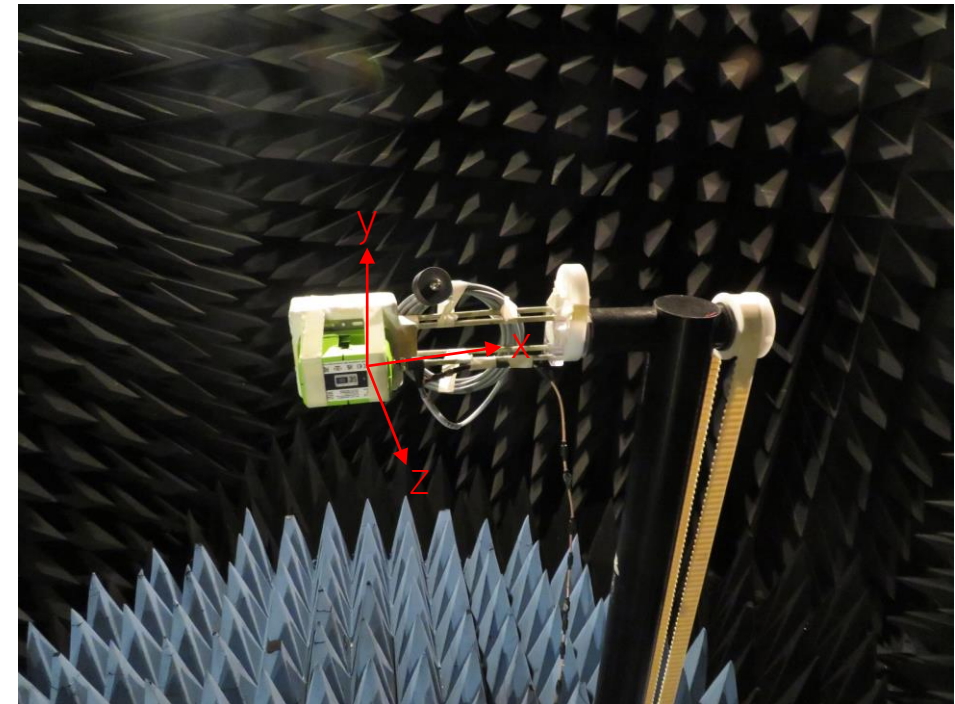


Device in free space



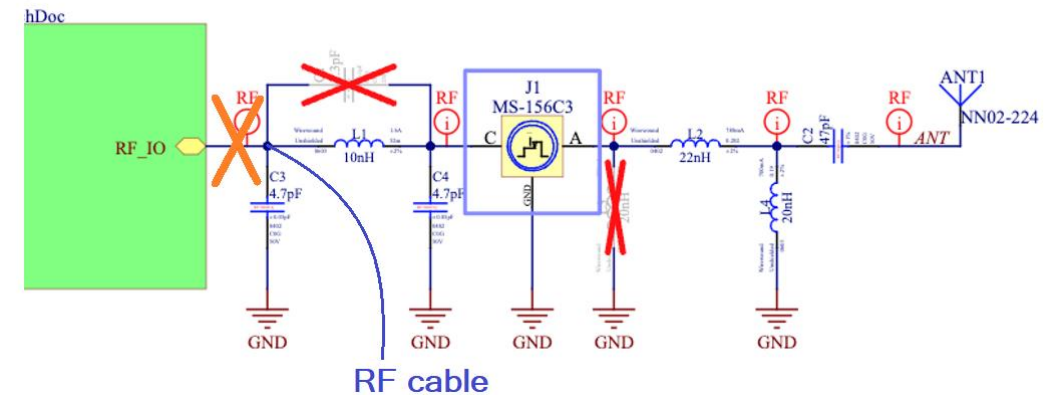
Device with metal back plate

EFFICIENCY/TRP MEASUREMENT SETUP



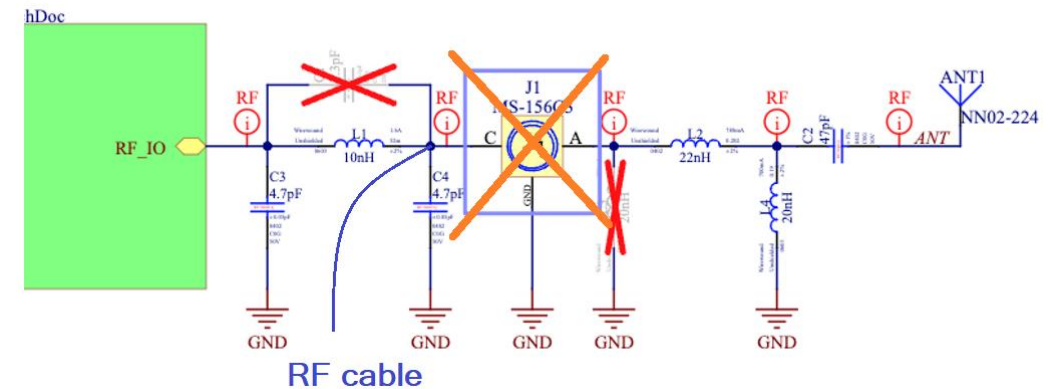
ANTENNA S11 WITH LPF MEASUREMENT SETUP

- Low Pass Filter (LPF) effect on matching was checked
- Coaxial cable was soldered before LPF and the RF path to the chip was cut
- Matching was checked with metal back plate



SPURIOUS EMISSIONS MEASUREMENT SETUP

- Device spurious emissions were tested using spectrum analyzer
 - Peak detector was in use
- Coaxial cable was soldered before the test connector and connector was removed



Glossary

- Radiation (rad,) efficiency - antenna efficiency excluding mismatch loss
- Total efficiency - antenna efficiency including mismatch loss
- System total efficiency - antenna efficiency including mismatch loss, including matching and losses from external matching network
- TRP (total radiated power) – power radiated from antenna, including all losses
- TIS (total isotropic sensitivity) - total available receive performance of a device with a real antenna