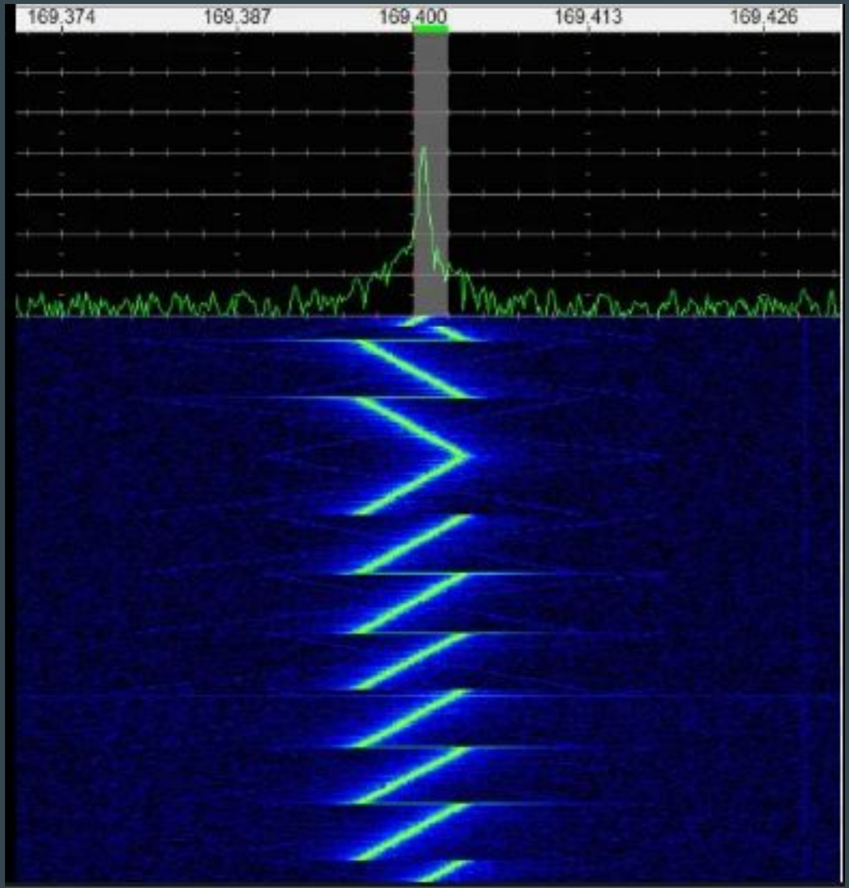
Drift test on LoRa device

Methodology and overview

What is a LoRa?

Wireless communication technology designed for long-range, low-power communication between devices.

Commonly used in the Internet of Things (IoT) applications where devices need to communicate over long distances while consuming minimal power

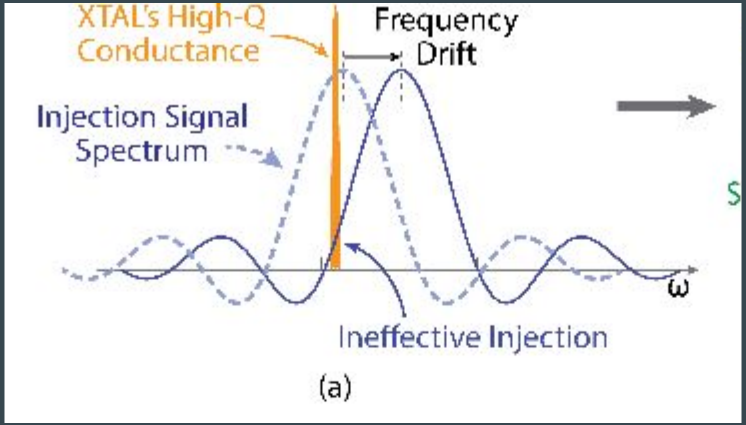


What is frequency drift?

Frequency drift refers to the change in the frequency of a signal over time. It can occur for various reasons, and its impact depends on the context in which it occurs

What causes it?

- Temperature variation
- Aging of components
- Environmental factors
- Crystal oscillator drift



Drift is a problem if it is big enough to change the emitting frequency out of the receiver sensibility

Previous information

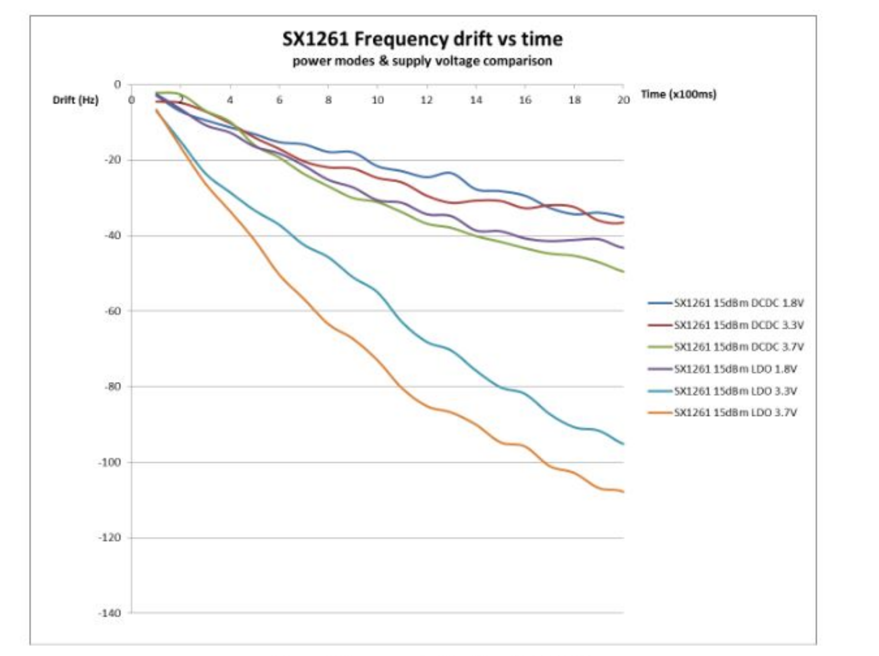


Figure 6: Frequency Drift vs Time for SX1261

- Some previous information was gathered by the datasheet of the radio used in the SiP (AN1200.37: Recommendations for best performance)

- Already knowing that just the radio present this amount of drift, we expect that joining the other components may cause a bigger impact, that is what we were looking for

https://www.semtech.com/products/wireless-rf/lora-connect/sx1262

Methodology

In ambient temperature, using the device with TX configuration and with continuous wave (not modulated), measure (using a spectrum analyser) the center frequency during a slot of time correspondent to the biggest LoRa packet that can be sent.

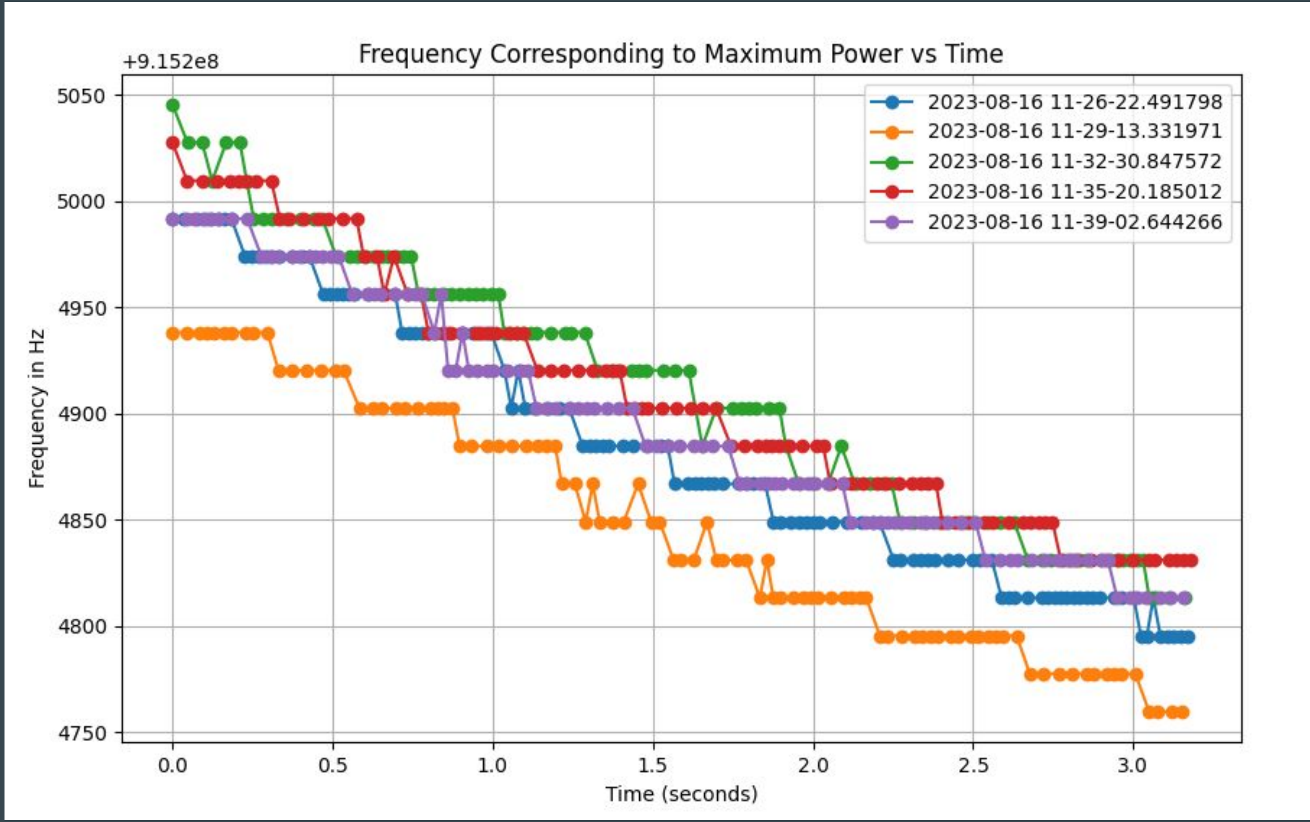
Step-by-Step

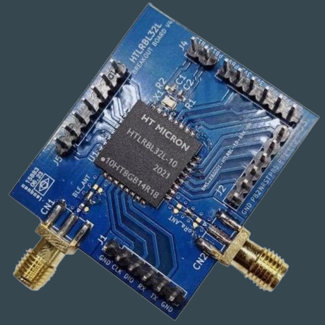
1. Setup LoRa board and connections
2. Configure LoRa Device with a Continuous Wave
3. Set Frequency and Bandwidth in the Spectrum Analyser
4. Measure Frequency, taking 100 measures for each time slot (Repeat it 4 times)
5. Recording Data
6. Plot the graph for center frequency (max frequency) over time

Python code

https://github.com/kernekarina/Drift_test_LoRa

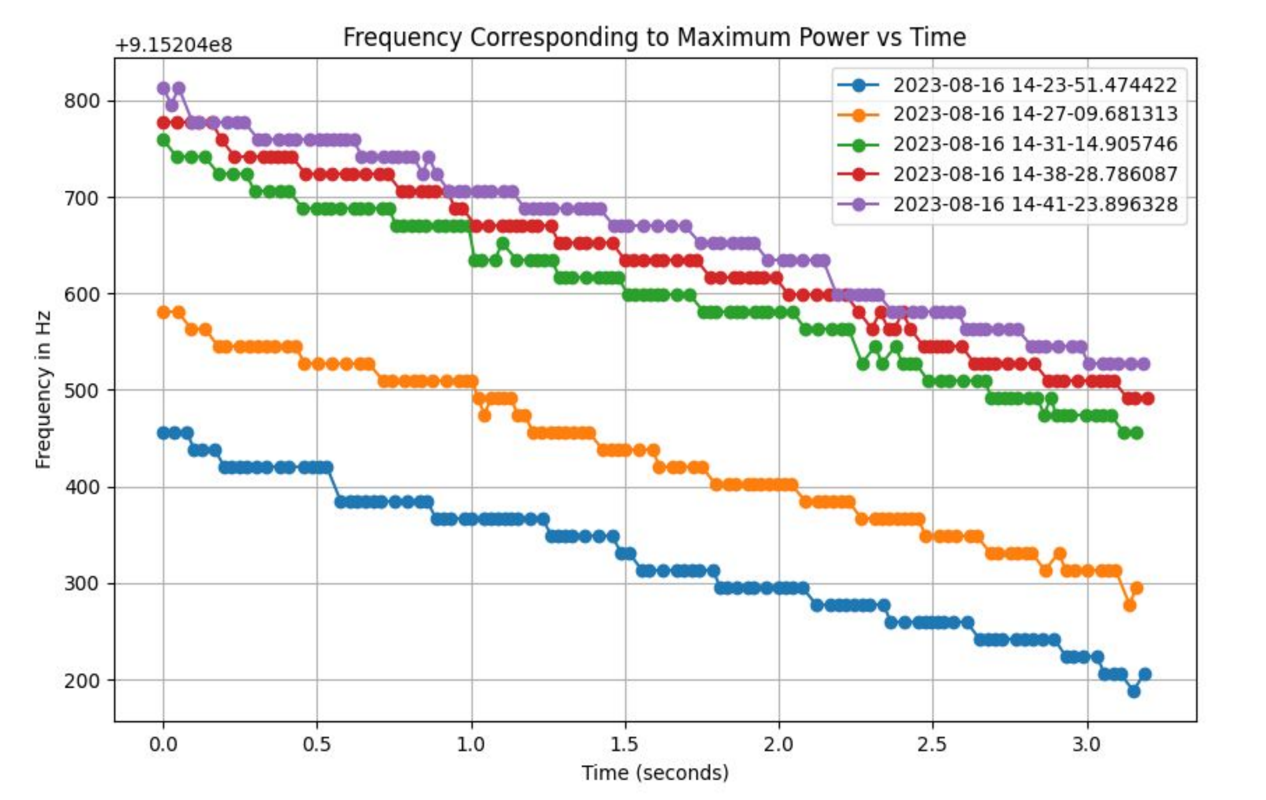
Results with solded sample

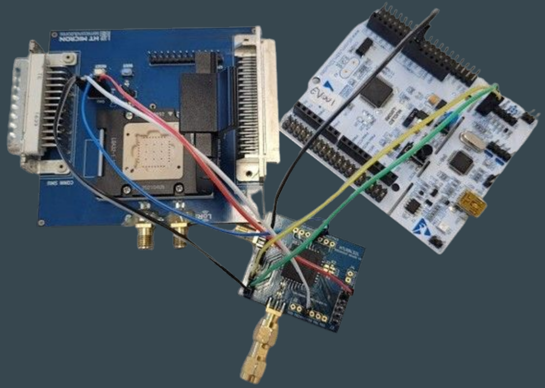




- 5 different measures in sequence
- Using 4s as the TX time
- Test with the Breakout Board
- Biggest variation: ~200Hz

Results without soldering





- 5 different measures in sequence
- Using 4s as the TX time
- Test with the test board
- Biggest variation also around 200Hz

Conclusions

The test involved subjecting the device to its maximum stress, simulating a scenario it is unlikely to encounter in practical use. Despite these extreme conditions, we observed a frequency drift of no more than 200Hz. Considering a bandwidth of 250KHz, this represents a mere 0.08%.

This minimal drift is well below a threshold that would compromise signal transmission, ensuring the device's robust performance even in challenging conditions.