

LoRa Workshop

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Overview

- The lecture today is a workshop on LoRa
- We provide you with a microcontroller with a LoRa radio and an antenna
- You need your laptop and cables from your Lab Kit
 - If you have a MAC without USB ports, you need a USB-to-USB-C adapter

Overview

1. LoRa Communication with Adafruit Feather

- Setup of LoRa radios
- Point-to-point duplex communication (work with a lab partner)

What is LoRa?

- LoRa (**L**ong **R**ange) is a low-power wide-area physical layer
- LoRa chip is proprietary to Semtech
 - Based on chirp spread spectrum

Characteristics:

- Low power (Tx 39-124 mA)
- Low bit rate (300 bps to 10 kbps)
- Long distance (>10 km)

LoRa physical layer

Configurable parameters:

- **Carrier frequency (CF)**
 - 433, 868 Mhz (Europe), 867 Mhz (India), 915 (North America) → **unlicensed**
- **Transmission power:** Power used to transmit
 - 2-20 dBm
- **Bandwidth (BW):** range of available frequencies
 - 125, 250, 500 kHz
 - Increasing BW decreases transmission time
- **Spreading Factor (SF):** determines the chirps per bit
 - SF = 7-12
 - 2^{SF} chirps per bit
 - Increasing SF decreases transmission time
- **Coding rate (CR):** forward error correction rate
 - CR = 4/5, 4/6, 4/7, 4/8
 - Increasing CR increases transmission time



These can be configured in software to trade-off transmission range and data rate

Adafruit Feather 32u4 RFM95 LoRa Radio

Feather 32u4

- ATmega32u4 MCU (8 MHz, 3.3V logic)
- 32K of flash
- 2K of RAM
- Built-in USB
- SX1276 LoRa module

