# **EoRa Pi Battery Life Analysis** - Claude

## **Project Specifications**

**Battery Configuration:**

* Battery: 3000 mAh LiPo
* Average current draw: 175 µA
* Power measurement tool: Nordic Power Profiler Kit II (NPPK II)
* Accumulated charge at measurement stop: 1.76 mC (receiver in sleep mode)

## **Battery Life Calculations**

### **Theoretical Maximum**

* **Duration:** ~1.96 years (714 days)
* **Calculation:** 3000 mAh ÷ 0.175 mA = 17,143 hours

### **Realistic Estimate**

* **Duration:** ~19.2 months (586 days)
* **Adjusted capacity:** 2460 mAh (82% usable capacity)
* **Calculation:** Accounts for typical LiPo efficiency and battery characteristics

### **Practical Limit**

* **Duration:** ~13.5 months
* **Limitation:** Self-discharge becomes significant for deployments longer than 6 months
* **Self-discharge rate:** ~3% monthly for LiPo batteries

## **Power Measurement Details**

**NPPK II Measurement Results:**

* Average current consumption: 175 µA
* Measurement stopped with receiver in sleep mode
* Accumulated charge: 1.76 mC at stop point
* Indicates excellent low-power sleep state performance

## **Design Considerations**

**Factors Affecting Battery Life:**

* Temperature effects (cold significantly reduces capacity)
* Battery aging over time
* Actual current variations with:
  + LoRa transmission frequency
  + Sensor reading intervals
  + Environmental conditions
  + Wake/sleep cycle efficiency

**Power Optimization Notes:**

* 175 µA average suggests effective use of sleep modes
* Typical for LoRa module sleep current plus always-on peripherals
* Good balance between functionality and power consumption

## **Deployment Recommendations**

**Optimal Use Cases:**

* Long-term IoT deployments (1+ year without battery replacement)
* Remote sensor applications
* Environmental monitoring systems

**Documentation Suggestions:**

* Record measurement duration for the 1.76 mC accumulation
* Document sleep/wake cycle details
* Note active transmission current peaks
* Include temperature operating range considerations

## **Conclusion**

The EoRa Pi project demonstrates excellent power efficiency with an estimated 13-19 month battery life on a single 3000 mAh LiPo battery. The 175 µA average current consumption indicates well-optimized power management, making it suitable for long-term autonomous deployment scenarios.