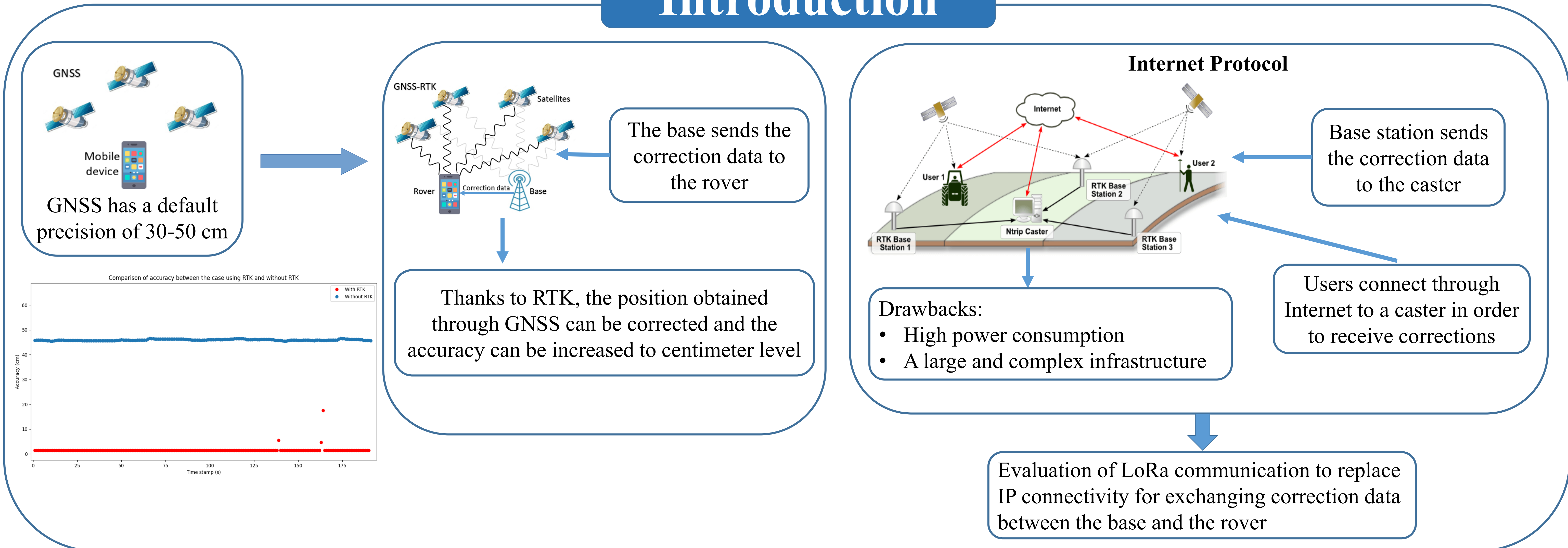


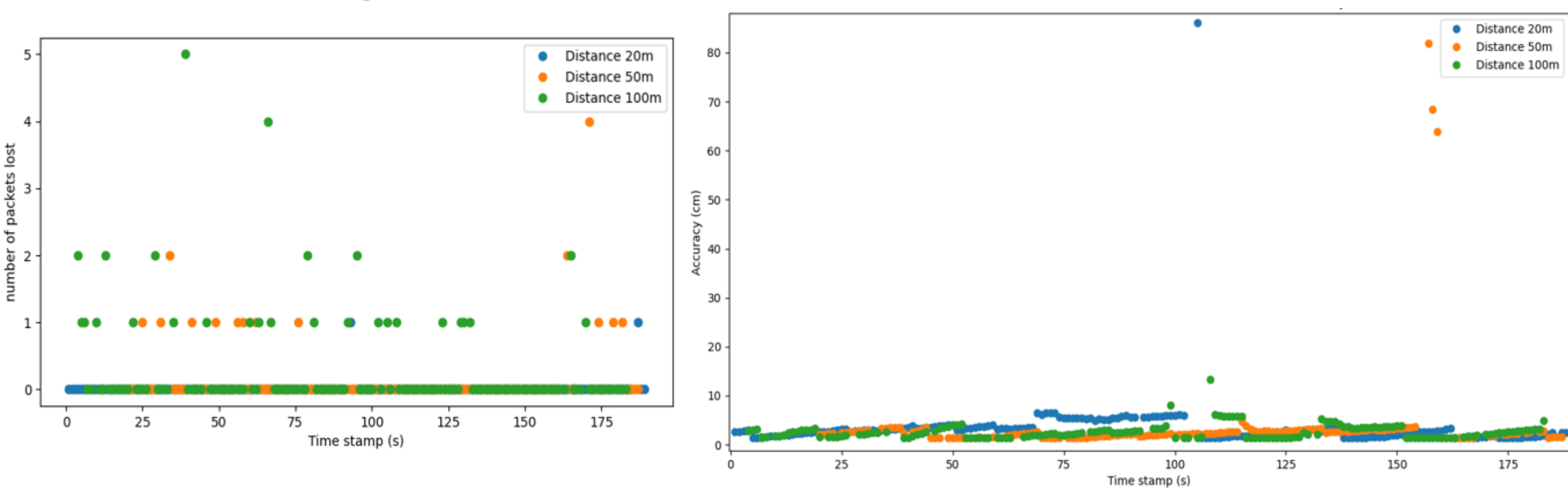
Integration of LoRa technology and centimeter-level geo-localization by satellites in GNSS/RTK systems

Introduction

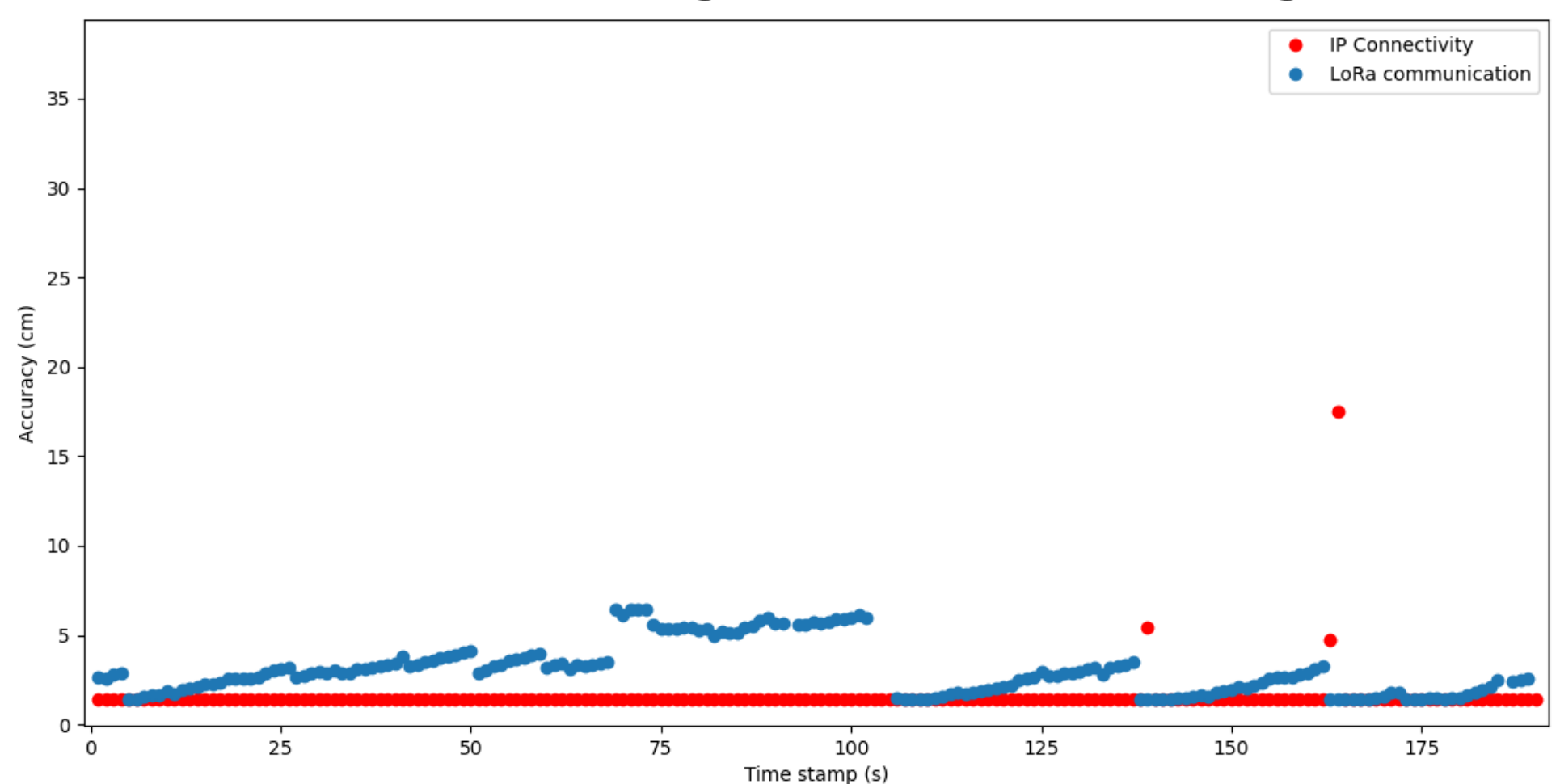


Results

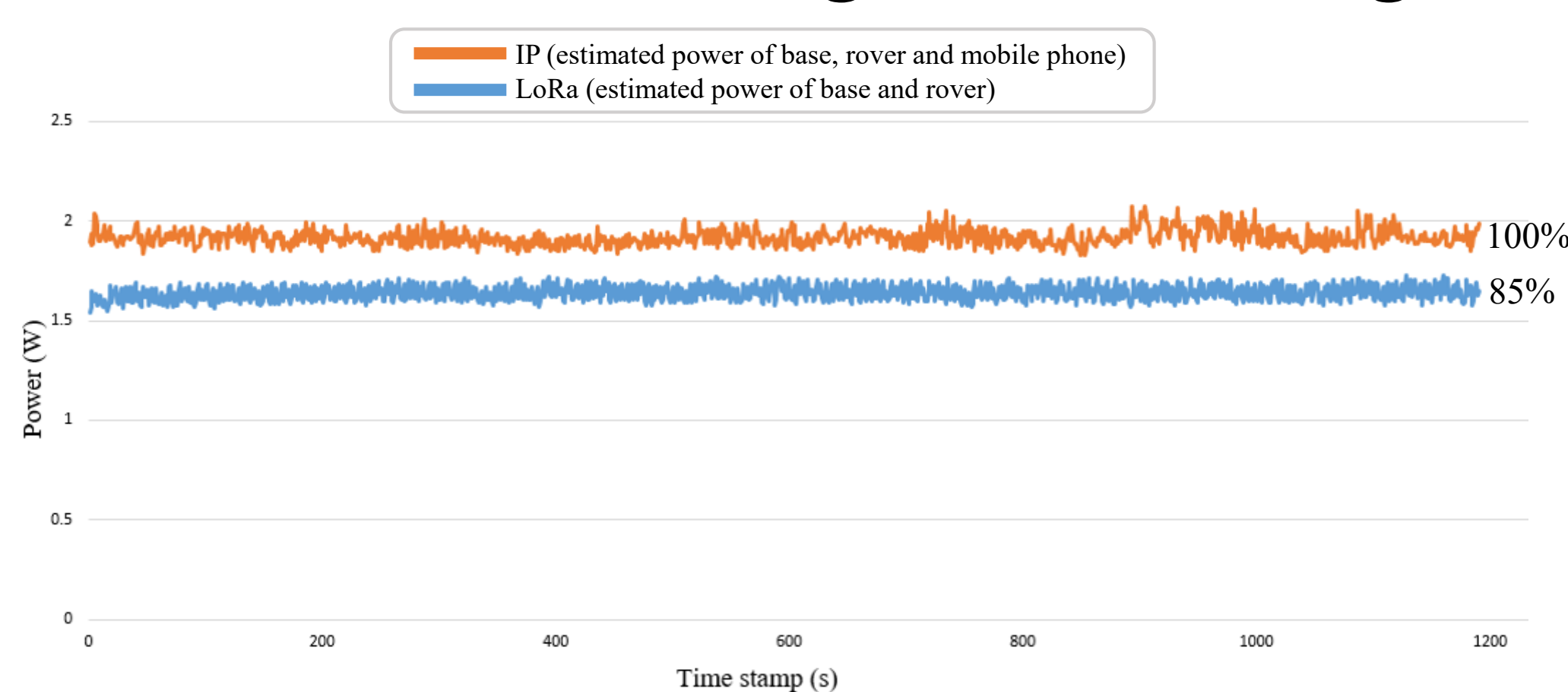
Correlation among the accuracy, number of messages lost and the distance of devices



Comparison in terms of accuracy between the case using Lora and using IP



Comparison in terms of power consumption between the case using Lora and using IP



Acknowledgements

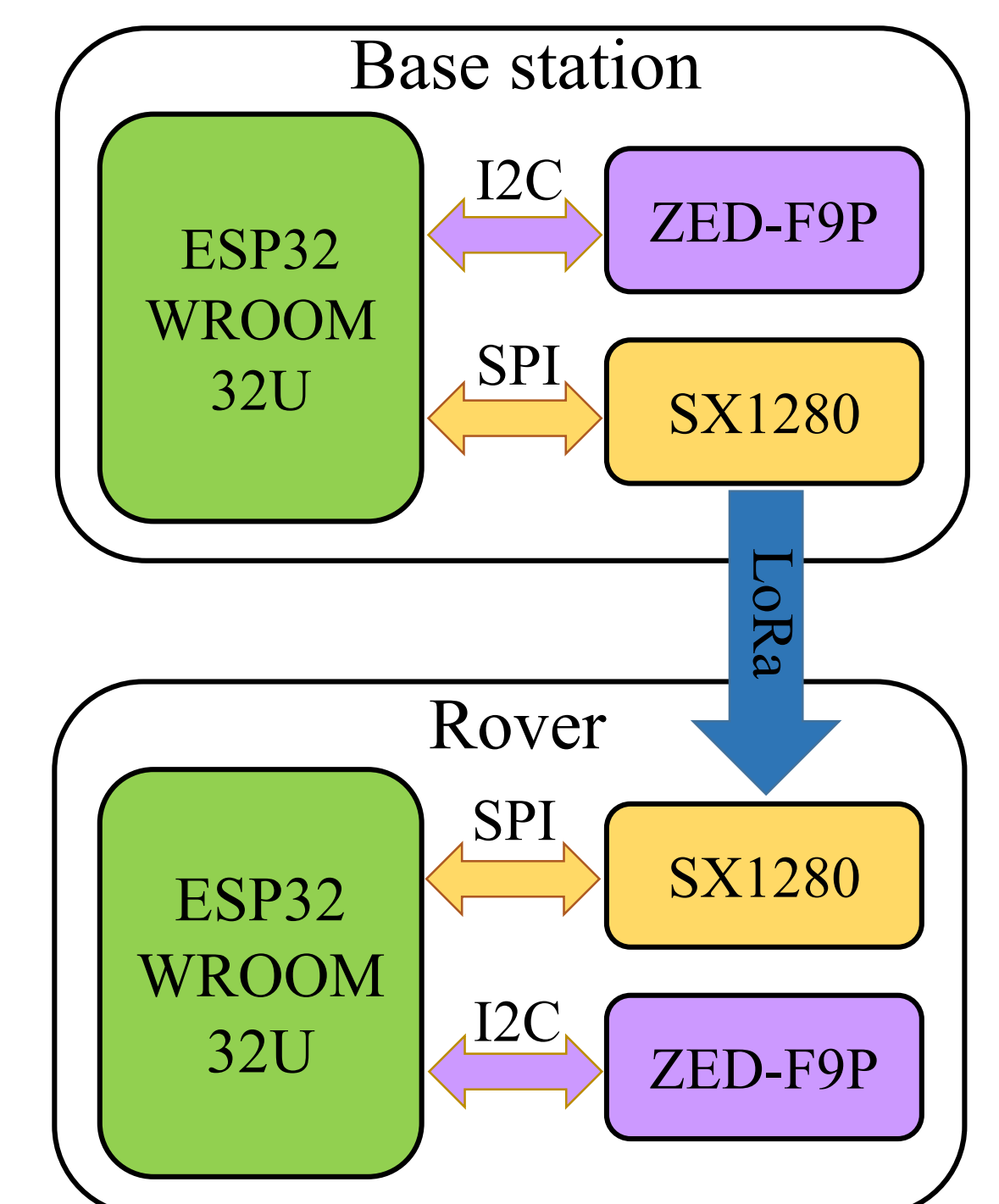
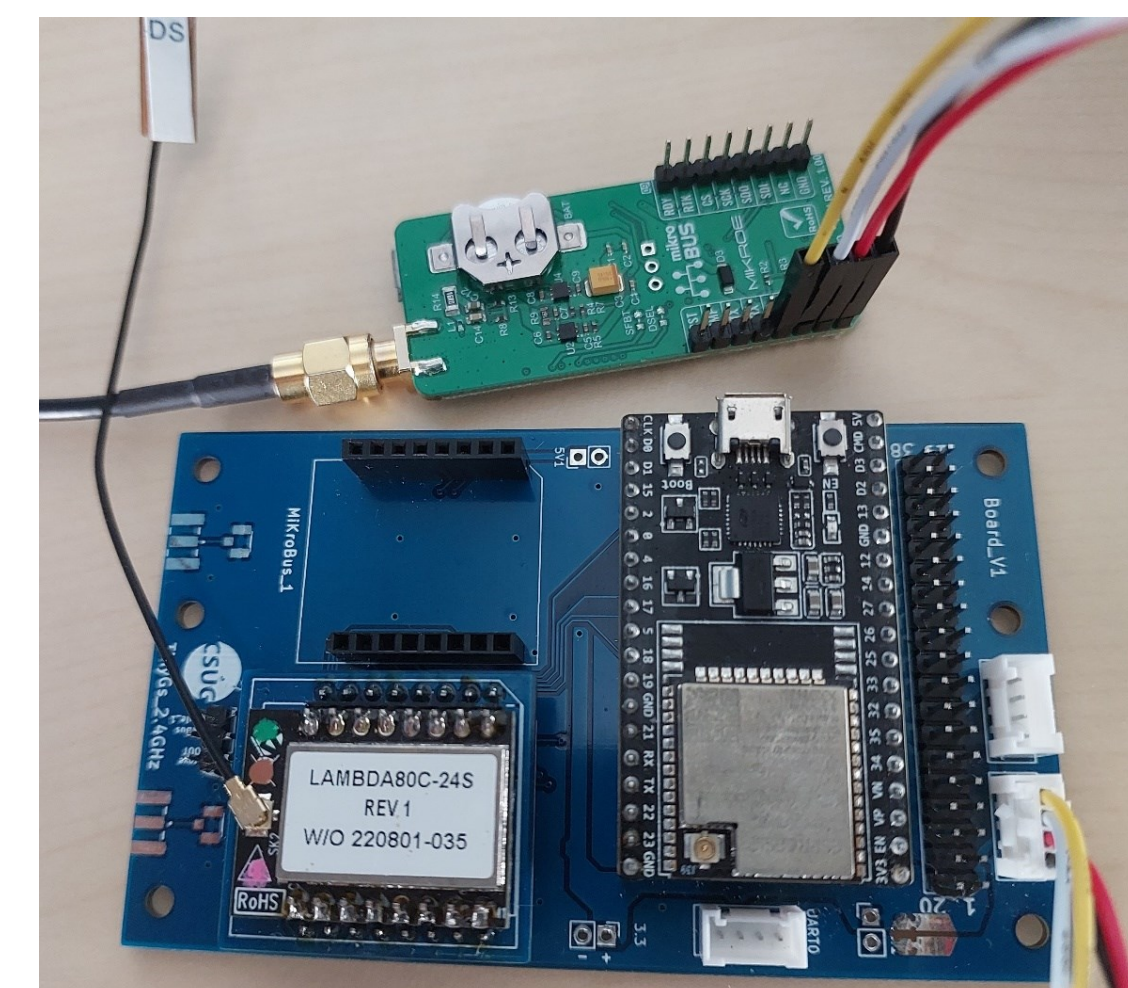
The project is funded by the LIG Emergence 2023

Methods

Hardware architecture

Main board TinyGS with the integration of:

- ESP32 Wroom 32U micro-controller
- LoRa SX1280 module providing ultra-long range communication in 2.4GHz
- ZED-F9P, a multi-band GNSS module with integrated multi-band RTK technology offering centimeter-level accuracy from U-blox



RTCM is a standardized protocol dedicated to exchange the correction data between the base and the rover

To exchange the RTCM data between the base and the rover, we encapsulate the data into a LoRa packet and broadcast it. Considering the fact that the LoRa packet is limited to 255 bytes, we have to fragment the RTCM data that are bigger than this limit

Conclusions

The usage of LoRa in the GNSS/RTK system:

- maintains a good precision
- improves energy efficiency
- improves the cost of the needed infrastructures

- The accuracy was below 6 cm in 90% of the measurement time
- The system is able to work fine for mobile devices within the radius of 400m from the base station in an urban environment