Multistatic RFID interrogation & localization with Cosmos/Orbit

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Intro

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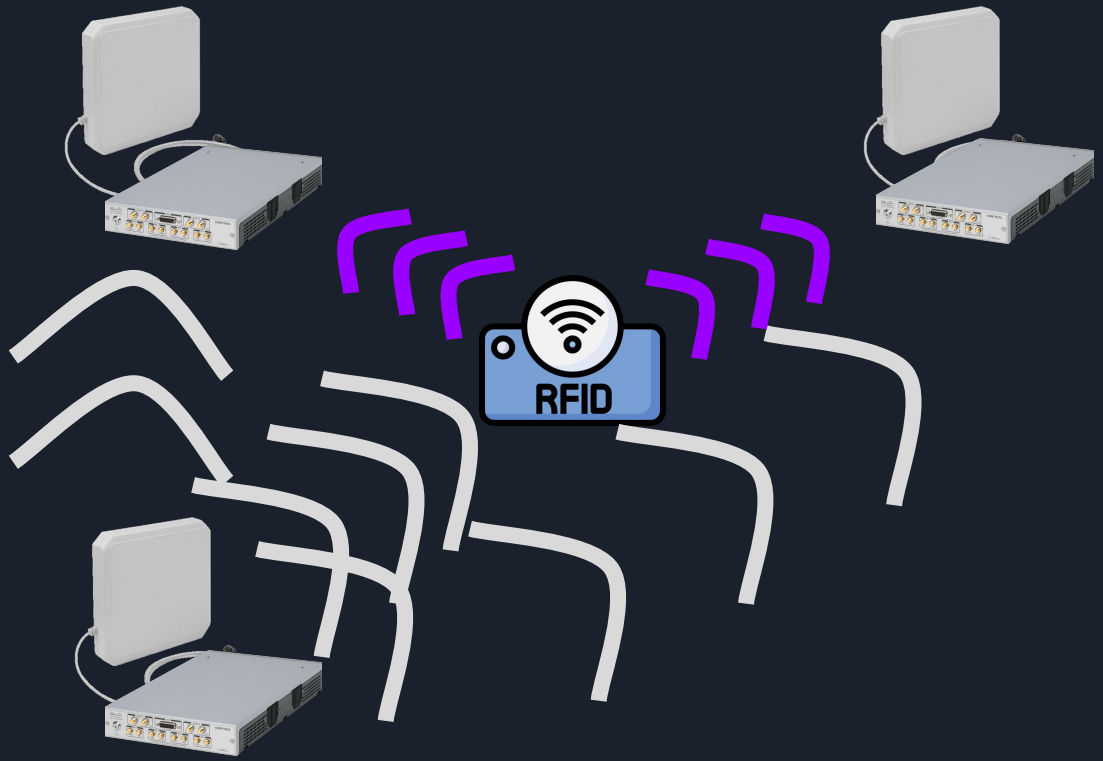
OVERVIEW

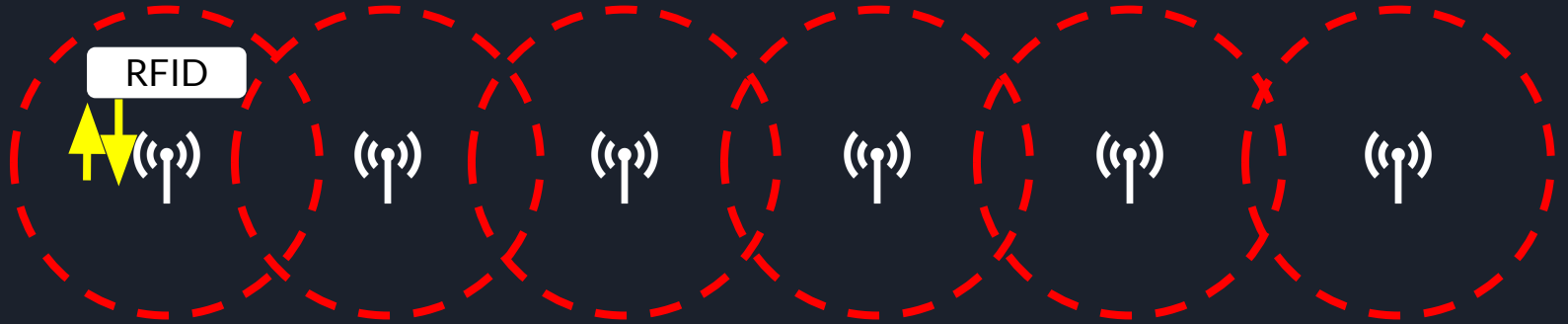


Why batteryless?

1. Ultra low cost.
2. Ease of attachment.
3. Reliability.

Monostatic vs Multistatic topologies

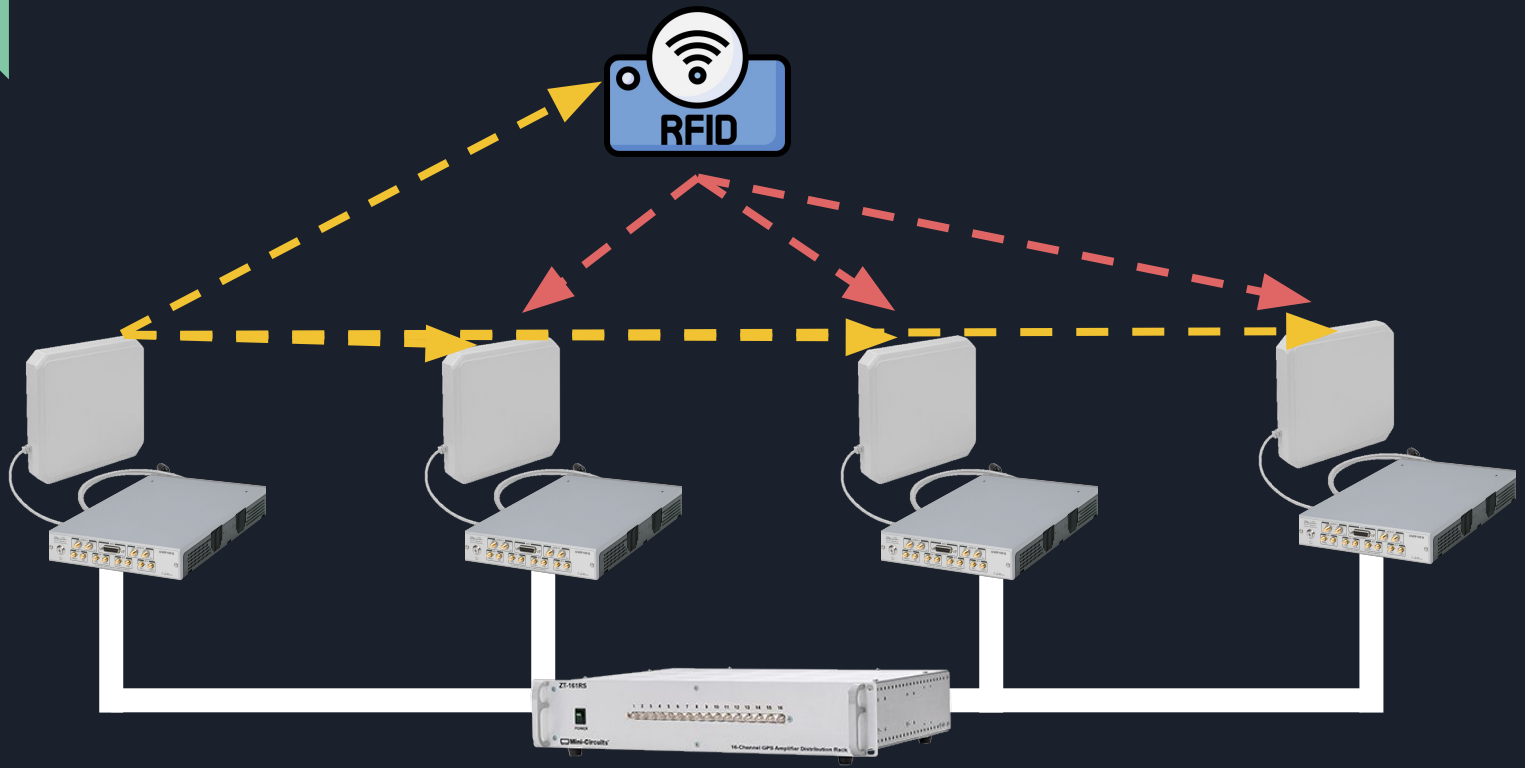
Batteryless RFID are heavily limited by their activation range.



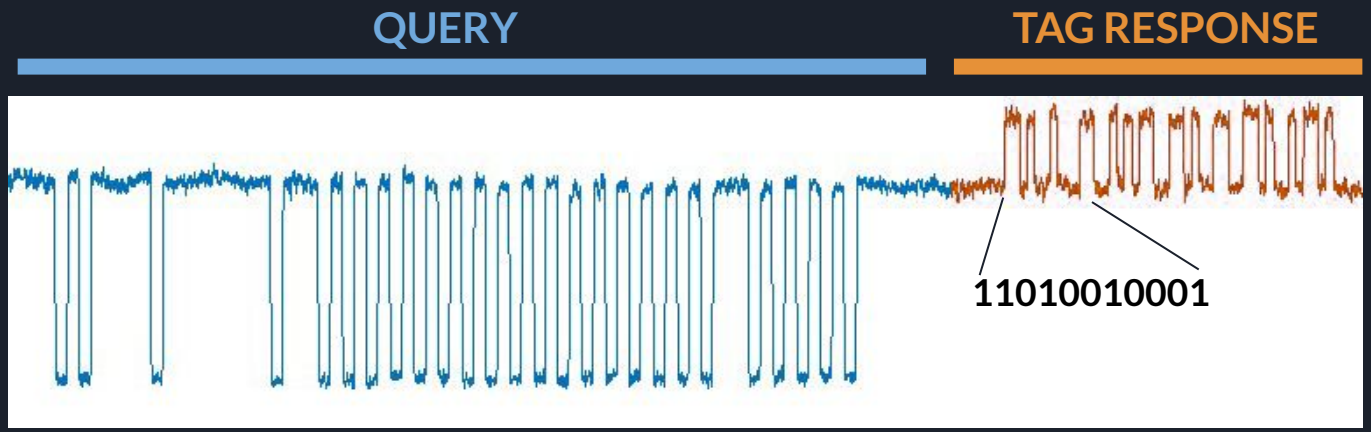
Monostatic vs Multistatic topologies

Multistatic topology enables long distance reading.

Topology



Detection

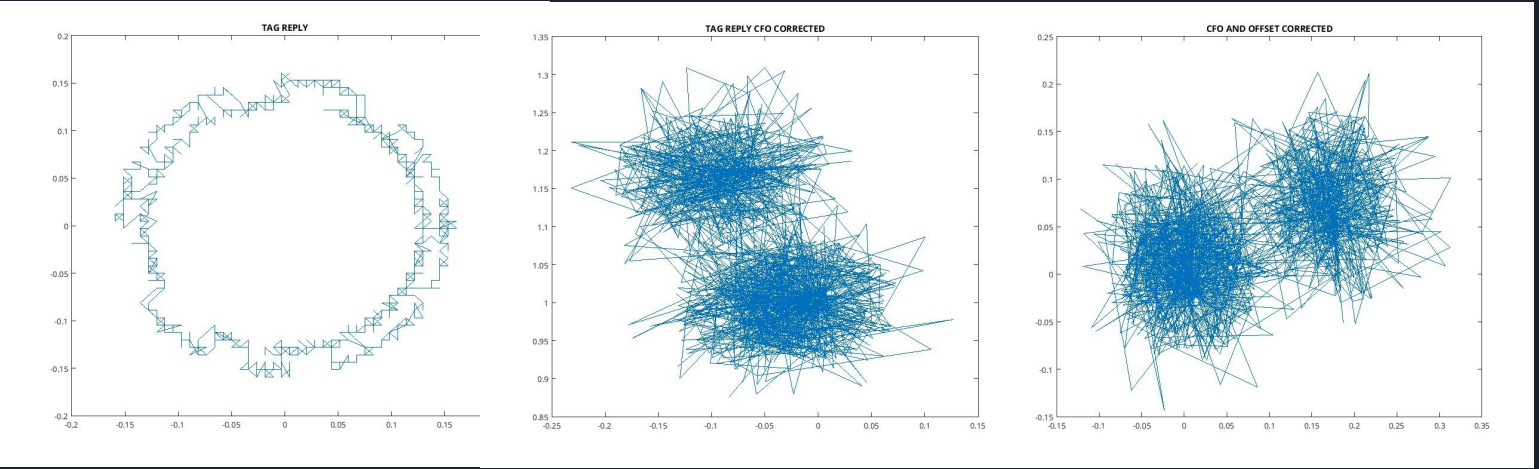


1. Detect query by looking for multiple pulses in a short time frame.
2. Cross-correlate after query with known preamble

CFO Cancellation

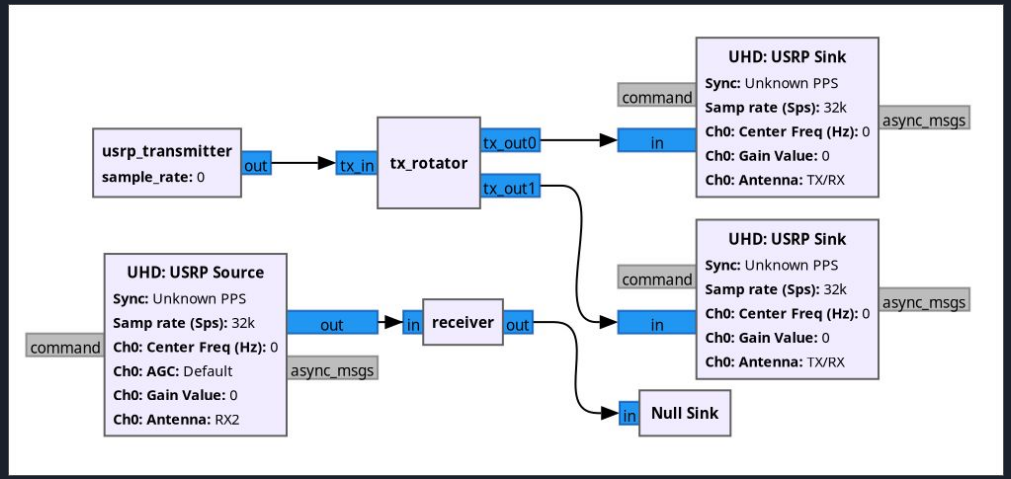
Phase extraction after CFO correction

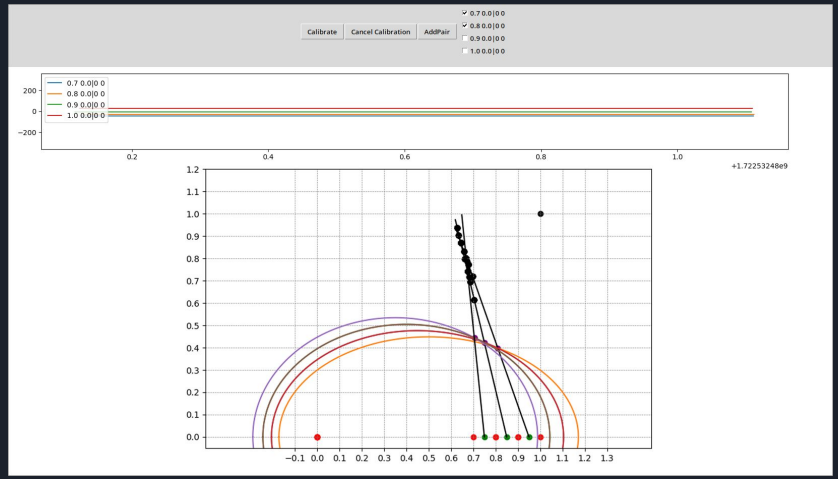
RAW SIGNAL | SYNCHRONIZED | OFFSET REMOVED



1. Divide tag response with samples captured during cw.
2. Remove offset by subtracting the mean of the samples during absorption.
3. Measure angle between the two states.

Implementation





OOT GNURadio modules communicate with python server over UDP

Real world applications

1. Package tracking.
2. Patient tracking in hospitals.
3. Personal item tracking.
4. Indoor drone localization.

Future work

1. Further experimentation and improvement on CFO cancellation.
2. Automatic CPO cancellation.
3. Full interrogation implementation leading to multiple tag distinction and localization.
4. Extend work to use cheaper SDRs and transmitters.
5. Further improve phase extraction and localization.

Thank you!!!