

A Novel Framework for ISAC-FD-enabled URLLC systems

Atefeh Rezaei, Ata Khalili, Falko Dressler, and Robert Schober

Highlights

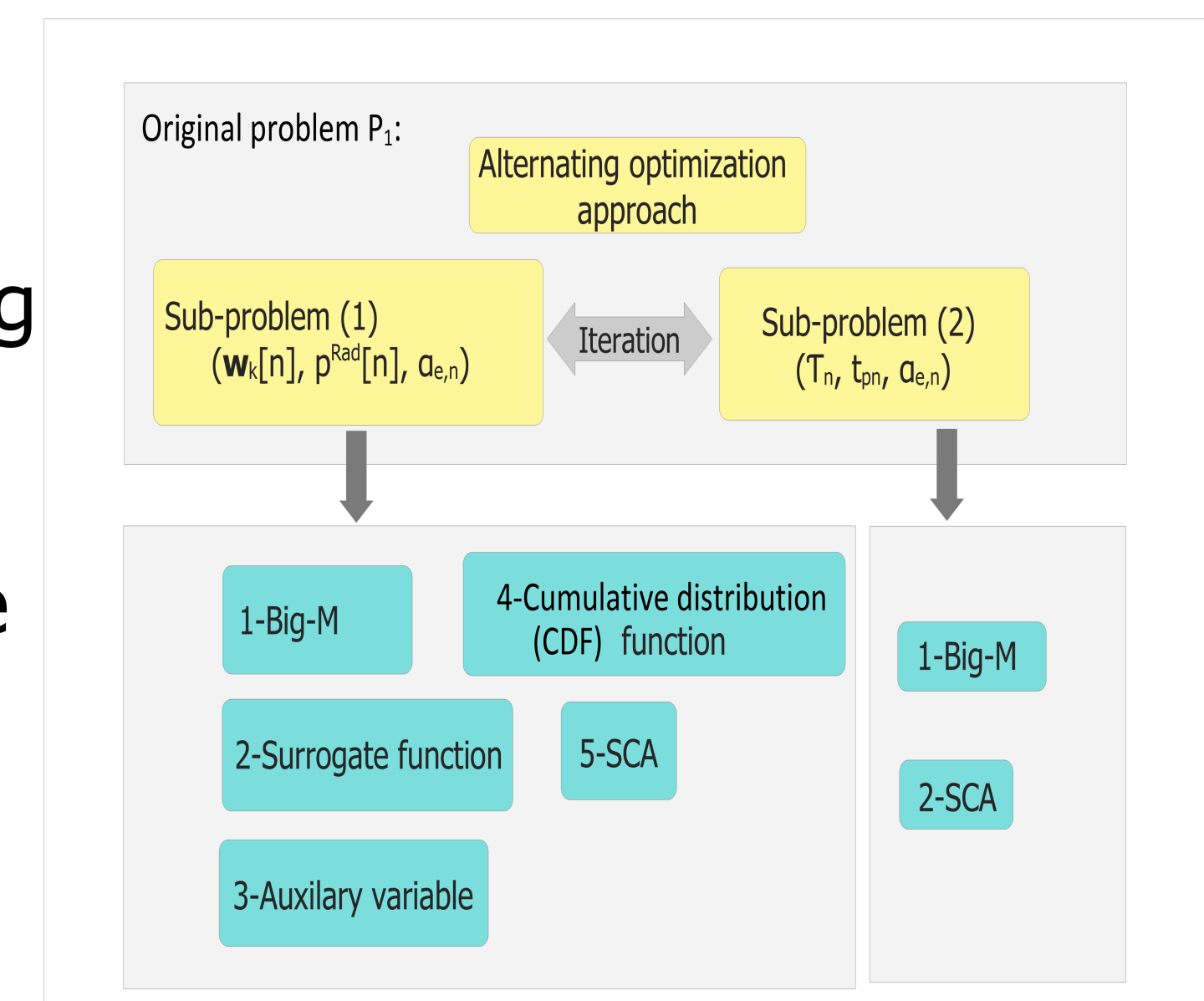
Application: ISAC in automation scenario

- ISAC coexistence with URLLC → Strict KPIs for Sensing & Communications (C&S)
- Trade-off management between C&S
- Full-duplex → Resource moderation & real-time operation
- Framestructure: Serving incoming packets within the listening times, opportunistically.
- Moderation of the energy consumption considering the residual interference issue.

Solution Framework

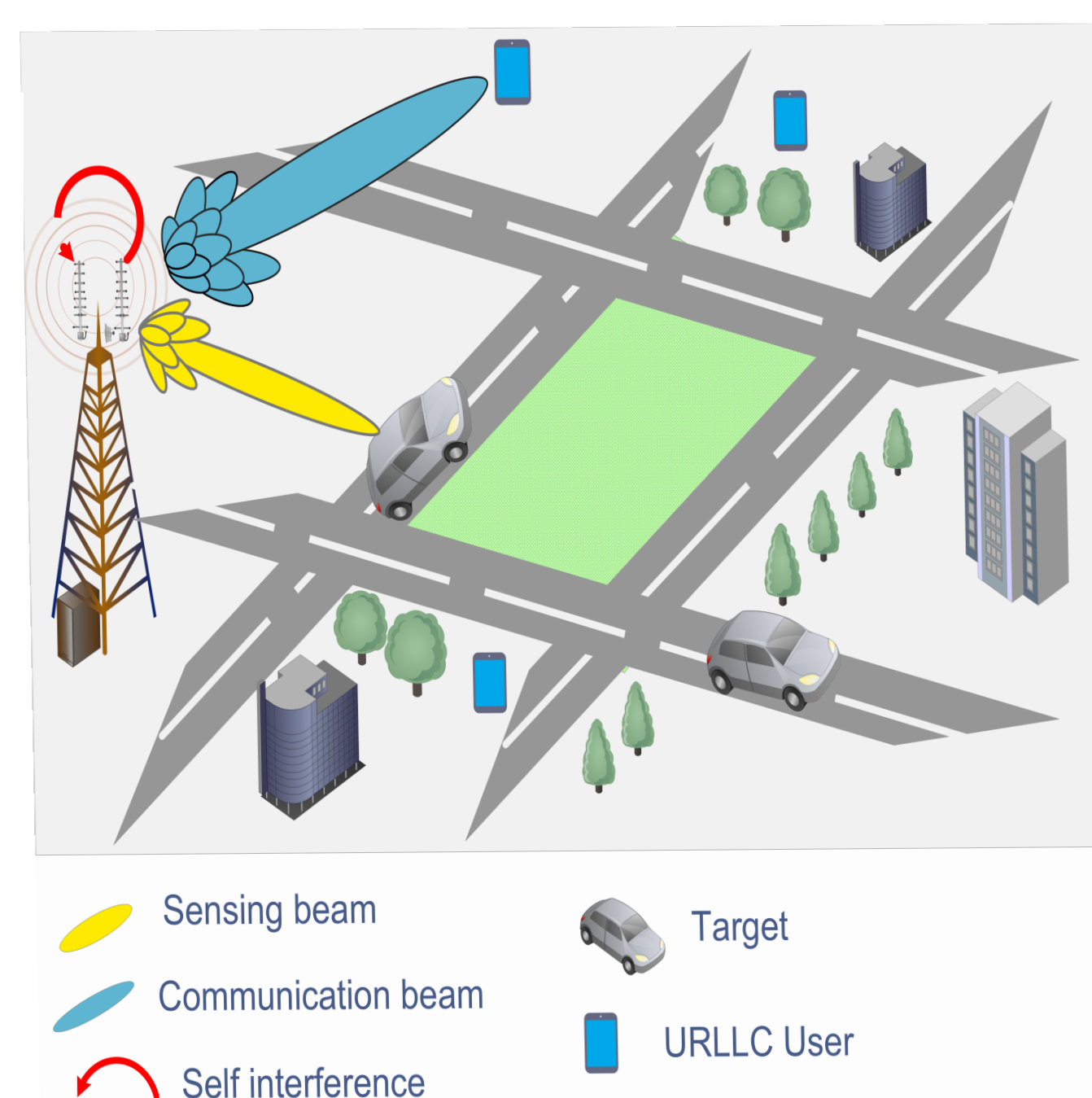
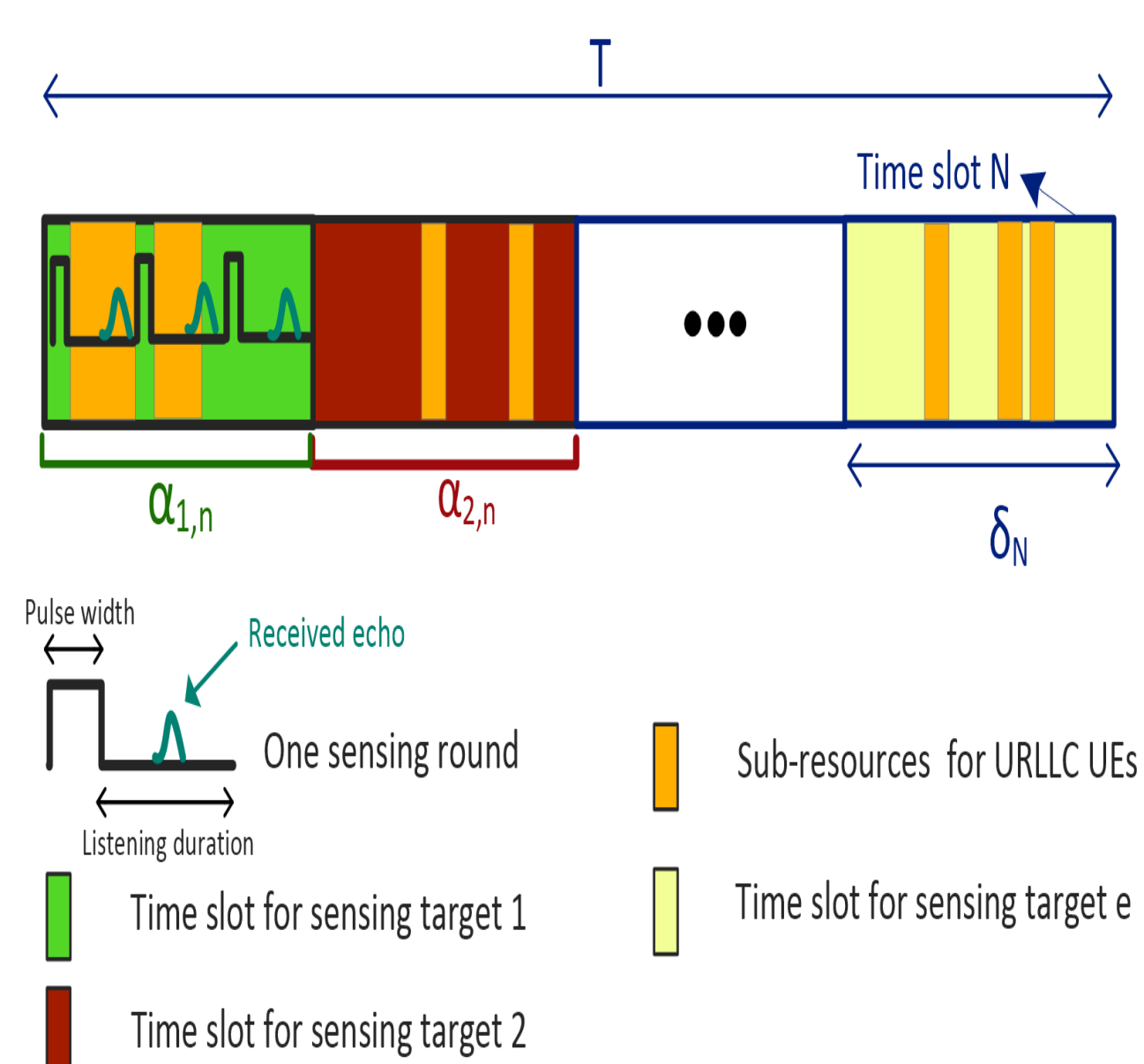
Variables:

- Communication beamforming
- Sensing beamforming
- Transmission time (Delay)
- Required active sensing time duration



System Model

Framestructure: To serve incoming packets within the listening times, opportunistically.



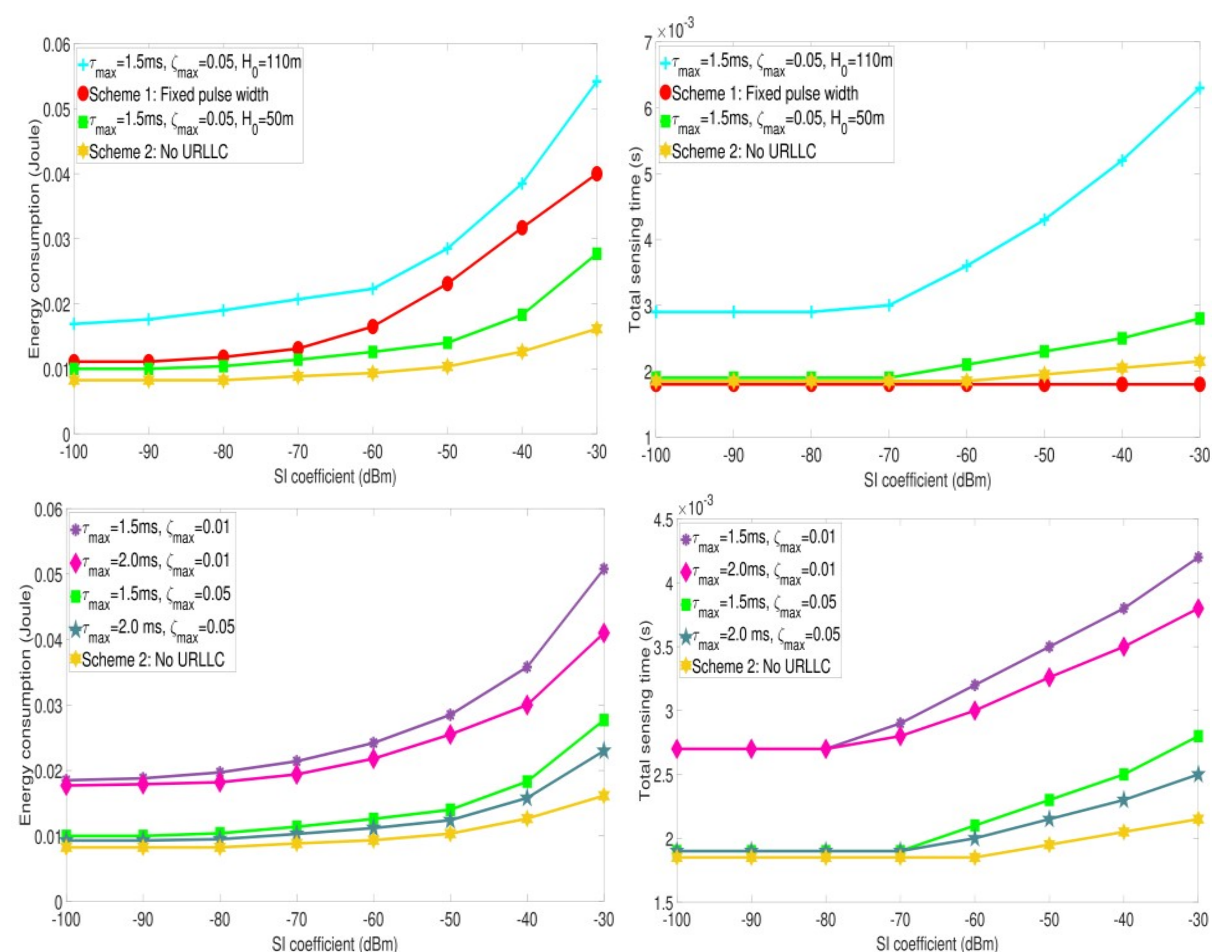
Problem Formulation

Idea: Energy saving plus guaranteeing the KPIs

- KPIs
 - Transmission time/tolerable delay
 - Decoding Error Probability
 - Achievable Data Rate
 - Cramér–Rao bound
- Concerning hardware limitations

Rational: Extremely-low energy cost demand, URLLC use-casse, accurate sensing → Future wireless networks.

Simulation Results



Analysis of the energy consumption and demanded sensing time versus different residual SI.

Take-aways

- Achieved energy saving by the proposed approach.
- Evaluation of the trade-off between the C&S qualities in terms of CRB and tolerable delay.
- Analysis of the residual SI coefficient and radar distance influence on sensing accuracy.

Next Steps

- Journal publication
- Considering mobility
- Advanced approaches for SI cancellation

Contact:

Atefeh Rezaei <rezaei@ccs-labs.org>