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**30hp Master's Thesis**


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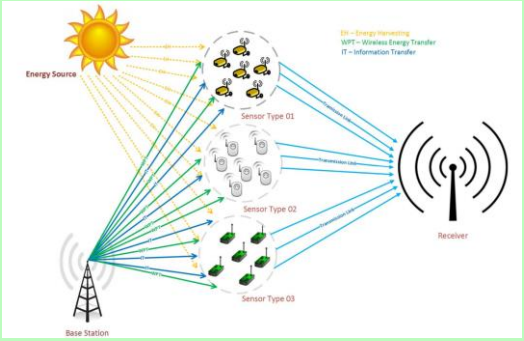
# Wireless Energy Transfer in Distributed MIMO Systems

*using a new all-digital radio-over-fiber hardware solution*

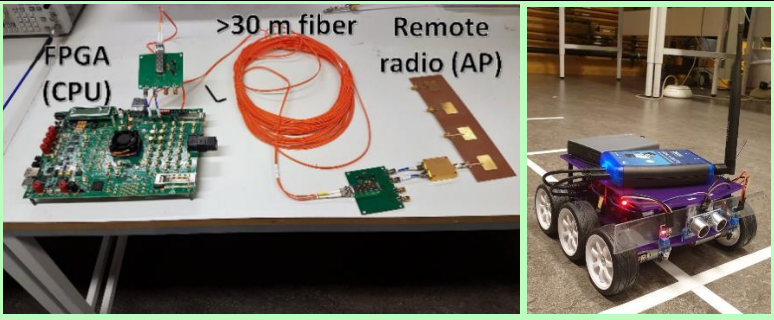
## Background

The latest generation mobile communication technology, 5G, offers many charming benefits such as faster and more reliable communication, self-driving cars, smart cities, augmented-reality etc. It is expected that these attractive benefits could lead up to hundreds of billions of connected devices. Hence, it is important to have efficient and *green* communication technologies for a sustainable future. Supplying each of these devices with batteries is not sustainable. Energy harvesting and wireless energy transfer methods are therefore becoming more and more interesting to support an environmentally and societally responsible wireless technology development.

We have implemented a new all-digital radio-over-fiber testbed[1], which can be used to investigate new and emerging wireless system concepts, including distributed MIMO. Digital communication signals are transmitted from a standard FPGA platform to remote radios while maintaining accurate RF signal synchronization (see below). A fully automated wireless receiver robot enables various measurement experiments in realistic environments. You will in this thesis use this testbed as a platform to explore the potential of wireless energy transfer in communication systems.




***A communication system with different energy transfer methods[2].***




***You will use our all-digital distributed MIMO measurement setup including an automated receiver robot.***

## Objectives

The overall objective of this project is to use our all-digital radio-over-fiber testbed to investigate the potential of wireless energy transfer in distributed MIMO wireless systems.

- Investigate, design, and build efficient wireless energy receiver circuits and storage solutions
- Integrate your energy transfer solution with our distributed MIMO testbed
- Perform experiments to investigate wireless energy transfer capacity & efficiency vs. #antennas, environment, etc.

If successful, we aim to report the results in a joint scientific paper.

## Qualifications

The project is very multi-disciplinary, including both hardware and communication system parts. The project is therefore suitable for 2 students with wireless and/or communication systems specialization. You will work closely with our multi-disciplinary research group at Chalmers and with a highly skilled group at Ericsson..

## Application and Contact information

We plan to start the project in Jan. 2020, so please send your application (CV and transcript) as soon as possible!


- Christian Fager, MC2, Chalmers (christian.fager@chalmers.se), tel. 031 - 772 5047
- Thomas Eriksson, E2, Chalmers (thomase@chalmers.se), tel. 031 – 772 1745
- Per Lundgren, MC2, Chalmers (per.lundgren@chalmers.se), tel. 031 – 772 1882
- Dr. Mikael Coldrey, Ericsson Research, Göteborg


[1] I. C. Sezgin et al., "A Low-complexity Distributed-MIMO Testbed based on High-Speed Sigma-Delta-over-Fiber," IEEE T-MTT., 2019

[2] T. D. Ponnimbaduge-Perera, et al. "Simultaneous Wireless Information and Power Transfer (SWIPT): Recent Advances and Future Challenges," in IEEE Communications Surveys & Tutorials, 2018.