

## Bachelor/Master's Thesis

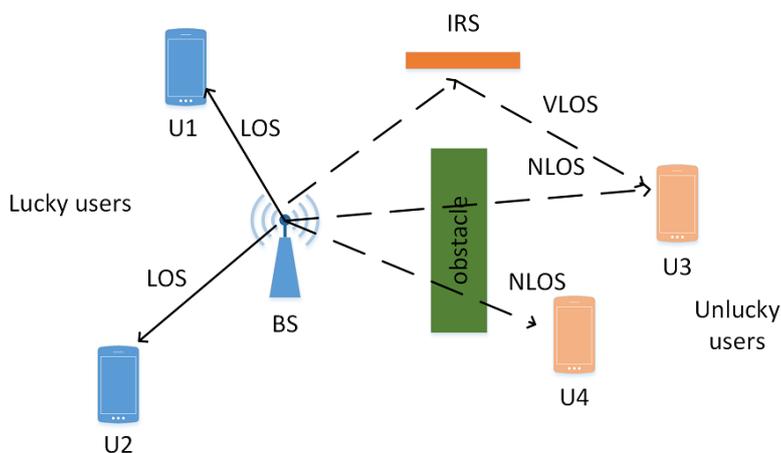
# IRS-supported Wireless Communication

## Abstract

Intelligent reflecting surface (IRS) is a promising concept in wireless communication which could be seen as an extension of massive MIMO. It offers significant potential in reducing energy consumption and increase in capacity of wireless networks. An IRS is a large surface attached to a wall, which consists of a large numbers of inexpensive reflecting electronic elements with reconfigurable parameters which can be electronically controlled. These electronic elements are capable of reflecting electromagnetic waves in a desired direction. Here the amplitude and phase of the reflecting waves are affected, thus changing the electromagnetic behavior of the wireless propagation channel. Each of these element unit can contribute a phase shift, hence the combined configuration is able to meet certain communication demands like beamforming. IRS is a passive system which acts as a signal scatterer and does not require any dedicated energy supply for channel estimation or signal decoding, which is fundamentally different from classical relays. However, from the system-level point of view an IRS aided wireless communication system is more complex as it consists of both active and passive components.

## Content

The goal of this thesis is to systematically study the gain from IRS for supporting wireless broadcasting transmissions. This is promising as the data rate of the broadcast channel is determined by the SNR of the weakest user, i.e. cell edge user with Non-line-of-sight (NLOS) radio propagation conditions. Here an IRS-supported system can be utilized in order to increase the SNR of the weakest user(s) so that the data rate of the broadcast channel can be increased. The feasibility of such a IRS aided wireless communication system should be analyzed by means of simulations.



Possible milestones are as follows:

- Literature research on IRS.
- Getting familiar with Monte Carlo simulation and Matlab.
- Integrating IRS model in simulation environment.
- Performing simulations to assess the feasibility of the approach.
- Evaluating and discussing the obtained results.

## Requirements

It will be helpful to have a basic understanding of *Wireless Communication Networks*, *Network Simulation*, and *Matlab*. In case you are not familiar with these requirements, you will need to familiarize yourself during the thesis.