

Fading illustration with SDR – Project Plan

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	Date	Signature
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1 Introduction

For the semester thesis at the Eastern Switzerland University of Applied Sciences (OST) it has been requested to create a demonstrative setup to show the fading effect, which is present in real world wireless communication systems. The device is intended to be used for pedagogical purposes such as to show the effect at the Open Days or for demonstrations during future lectures on fading channels.

2 Task Description

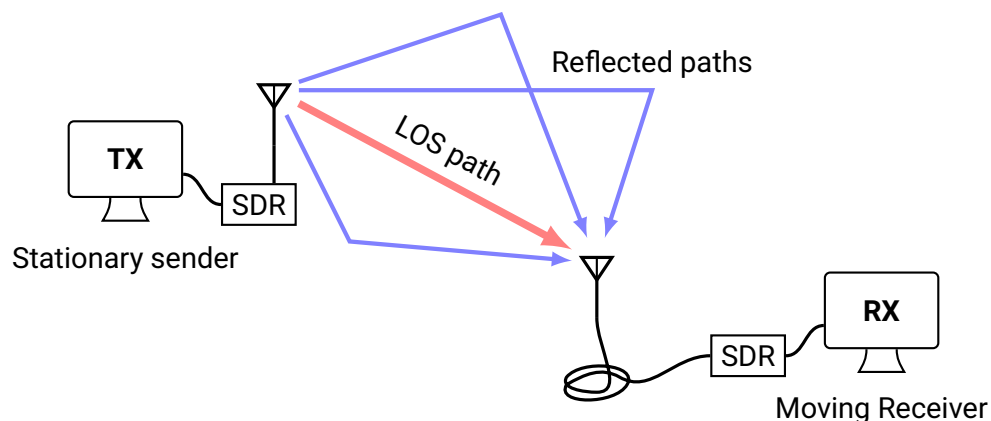


Figure 1: Sketch of the setup that will be modelled and implemented. The model will need to be adjusted depending on whether there is a line of sight (LOS) between the sender and receiver.

The scope of the project is to realize a demonstration of a fading channel using a software defined radio (SDR). Out of the many types of fading effects that exist only small scale fading effects ought to be shown in the demonstration, specifically multi path propagation fading is of interest. The project requirements that must be fulfilled are thus:

- Understand of one or more mathematical models of the fading effect.
- Evaluate a suitable development environment for the SDR.
- Develop of a signal processing chain for the SDR transmitter and receiver.
- Develop of an interface to vary the parameter of the transmission, such as the modulation scheme.
- The demonstration should work with both stationary and moving receivers.

3 Development plan

The development of the project will be carried out roughly in three phases, of which the first two will start in parallel.

1. Develop an understanding of fading and how to work with SDR devices.
2. Create a basic TX – RX line *without* a fading channel model.
3. Integrate the fading channel model into the prototype.

3.1 SDR Device

Finding the right software tool, like GNURadio or Matlab, for the Project and learn how the program works. The same with the Hardware, is the *USRP B210* the best option or is there an other SDR, which fits better too our requirements.

3.2 Prototype

Create the first Prototype line TX-RX without any effects. Including some simulation on that setup first and then tests and measurements on the Hardware. After a successful set up, some possible variable parameters will be included.

3.3 Theory of fading channels

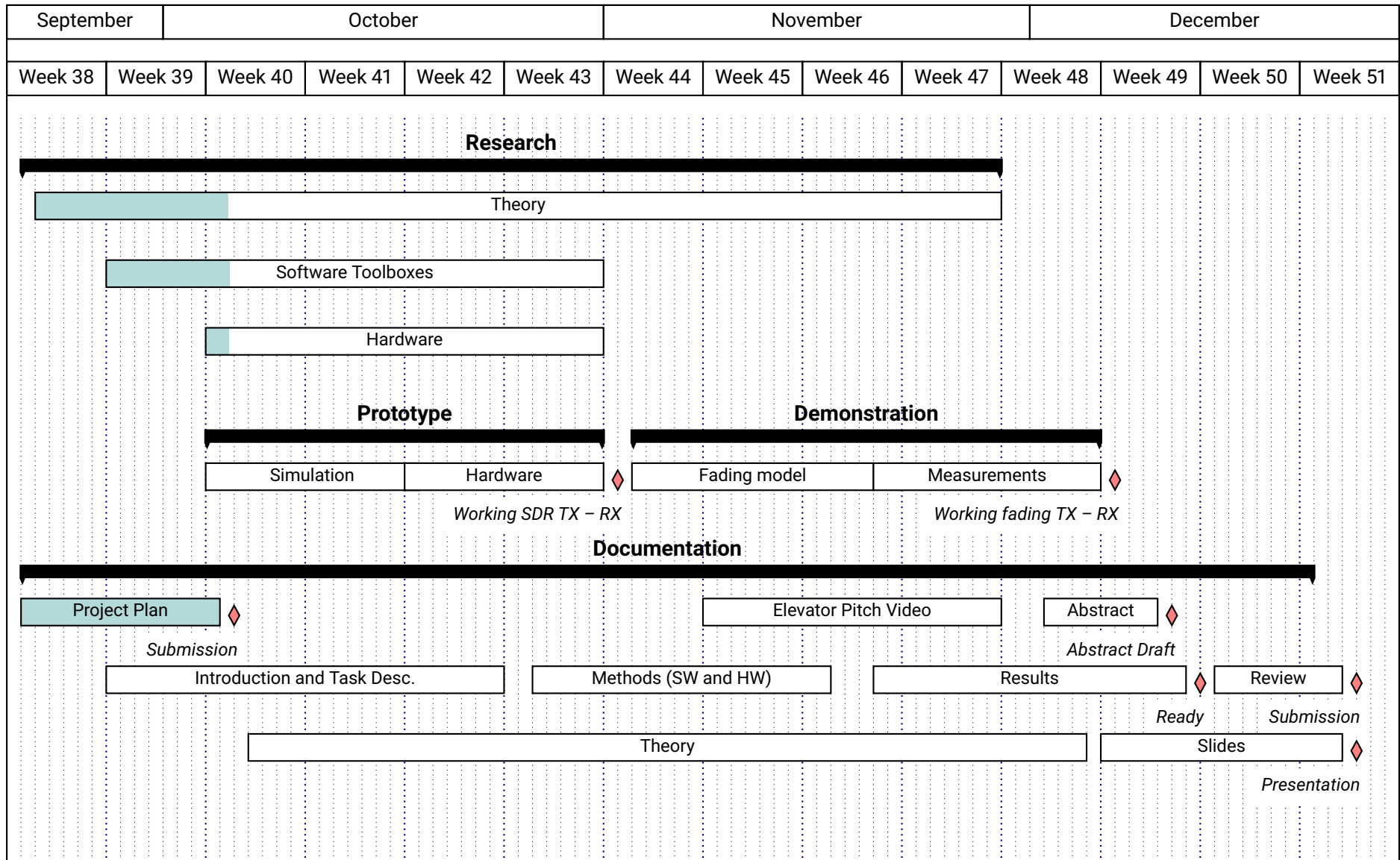
When the Prototype works the integration of the fading channel models starts, including simulations and tests on the Hardware. At the end comes the same with a movable Reviser. Walking will be used to demonstrate that on a scenario. If there will be some time left also with the help of a car.

4 Milestones

Table 1: Milestones of the project

Name	Due date	Description
Project plan	Week 40	Finalization of this document.
Working SDR TX – RX	Week 44	Completion of an RX – TX line on SDR with variable parameters for configuration.
Working fading TX – RX	Week 49	Both the simulated and the physical transmission lines work and it is possible to observe the consequences of fading.
Abstract	17 Dec. 2021	The abstract is handed in.
Documentation	Week 50	The documentation is complete both on the theory and practical sides.
Presentation	23 Dec. 2021	Presentation of the project on Campus.
Submission	24 Dec. 2021	–

Figure 2: Project schedule (Gantt diagram)



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