



- Bachelor/master/project work -

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**Title: Investigation and modelling of waveguide systems without circulator using the example of REGAE or SINBAD**

**Project description:**

The system modelling of acceleration structures, so-called cavities, is to be extended by the waveguide part, which has not yet been investigated in terms of its behavior.

The goal of this work is to investigate the behavior and propagation of multiple reflections of the forward wave at the cavity and the klystron in systems without circulator. The klystron is a power amplifier in the gigahertz (GHz) range to amplify power from watts (W) to the megawatt (MW) range. This power drives a cavity resonator, which transfers the stored energy to electrons in the form of an accelerating field and accelerates them. The circulator is used in many systems at DESY to dissipate and damp reflections from the cavity and thus the returning wave. However, it is not yet operational for the systems of REGAE and SINBAD with an operating frequency of 3 GHz at input powers in the MW range.

This work contributes to the development of the next generation of high-precision controls of normal conducting structures at DESY.

The work is divided into the following tasks:

- Familiarization with the structure of the system
- Mathematical modelling of the forward and return wave in the waveguide
- Validation of the modelling on the basis of measurement data
- Documentation of the results

**Requirements:**

*Basics of system theory*

*Basics of high frequency technology/waveguide theory are advantageous*

*Experience in Matlab/Simulink*

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