Karlsruher Institut für Technologie

ENERGY LAB 2.0

19.02.2024

Master thesis

Development of KARA accelerator's digital twin

Job Description:

Accelerators are complex and energy-intensive machines that require a stable and high-quality power supply, usually provided by the public electrical grid. However, the inflexible power demand of accelerators makes it challenging to maintain a stable power supply. To improve their performance, the main technical goal is to develop a digital replica of the KARA accelerator (known as a digital twin) in a real-time simulation environment. This will allow for the accurate reproduction of the actual facility and enable experimental validation of improvements in energy management and power quality without disrupting research work. join us in collaborative effort between the Power Hardware in the Loop lab at Energy Lab 2.0 and the KARA synchrotron facility at the Institute for Beam Physics and Technology. We are working on creating a digital twin, which is a power electronic model of critical components of the KARA accelerator. To simulate them in real-time, we use MATLAB/Simulink and electrical drawings of crucial devices in the KARA accelerator as modelling reference. Your involvement will contribute to the development of power electronic models for these electrical components. This will enhance our understanding and optimize their performance.

What we offer:

- Insights in day-to-day research operations, conducting experiments, and publication process
- Hands-on lab experience in the unique and advanced 1MW Energy Lab 2.0 environment

Your Tasks:

- Understanding the electrical connections in electrical schematics.
- Modeling the electrical system of each crucial component based on electrical schematics.
- Conducting offline testing with a power profile.
- Testing the model in real-time with a power profile.
- Real-time testing with an actual power profile.

Your Profile

- Finished Bachelor in Electrical Engineering
- Experience with MATLAB/Simulink with an interest in power electronic simulations.
- Basic knowledge of particle accelerator facilities will be considered a plus.

If you are interested in this position, just contact us or send us your CV with a brief mail describing yourself and your motivation – we are looking forward to your application!

Contact:

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Start: From now on

Duration: Contract length is 6 months with the possibility to extend