

Designing new analog electronics for the electrostatic beam position monitors in the cooler synchrotron COSY

Advertising institute: ZEA-2 - Electronic Systems

Reference number: D068/2014, electrical engineering or computer engineering

Job description:

The Central Institute for Electronics (ZEL) is a scientific and technical institute at Forschungszentrum Jülich GmbH. It implements research and development projects in cooperation with the institutes of Forschungszentrum Jülich and with external partners.

Work at ZEL focuses on the development of electronic and information technology system solutions in sensor and detector technology, signal and data processing, measuring technology as well as imaging and image processing.

Forschungszentrum Jülich operates the cooler synchrotron COSY for basic research in hadron, particle and nuclear physics. COSY generates polarized and unpolarized proton and deuteron beams with beam pulses between 300 MeV/c and 3.7 GeV/c and high phase space densities by means of electron and stochastic phase space cooling. For beam position and intensity measurements at COSY, electrostatic beam position monitors (BPMs) are used. They generate two pickup signals each for the vertical and horizontal directions. The geometric structure of the BPMs means that the sum of the pickup signals is proportional to the beam intensity and the difference of the signals is proportional to the deviation from the middle of the beam tube.

As part of the plan for improving the beam parameters, new electronics will be developed for COSY's BPMs based on commercial beam position processors of the Libera family manufactured by Instrumentation Technologies. As the Libera electronics will have to be adapted to the beam position monitors, a master's thesis will first design novel analog electronics with the following properties:

- Broadband and low-noise preamplification of the pickup signals with impedance adjustment corresponding to the following requirements
 - Input impedance: 500 kOhm; Output impedance: 50 Ohm
 - Frequency response: 100–100 MHz (-3 dB)
 - Amplification: approx. 14 dB
- Coupling of the test signal
- Generation and galvanic separation of a high voltage to measure the rest-gas ionization. This necessitates the measurement of currents in the pA range.

- Form factor: VXI

In addition to the requirements for COSY, this work will also be incorporated into research and development activities for the future high-energy storage ring HESR, which is part of the planned international accelerator complex FAIR in Darmstadt.

There is also an option of continuing work in the form of a subsequent PhD.

Work on the master's will be conducted in Jülich as part of a cooperation between the Chair for Integrated Analog Circuits at RWTH Aachen University and the institutes ZEL and IKP at Forschungszentrum Jülich.

Requirements:

Master's student studying electrical engineering or computer engineering.

Limited-term contract:

6 months

Contact:

Dr. Stefan van Waasen
Central Institute for Electronics
Forschungszentrum Jülich GmbH
52428 Jülich
Germany

Tel: +49 2461 61-9400

Email: s.van.waasen@fz-juelich.de