



2020 HGF – GSI – OCPC – Programme for the involvement of postdocs in bilateral collaboration projects

Title of the project:

Measurement of the Pion transition form factor at the Mainz Microtron MAMI accelerator (PRIMA)

Helmholtz Centre and institute:

Helmholtz Institute Mainz /GSI Darmstadt

Project leader:

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Description of the project (max. 1 page):

The group at the outpost of GSI Darmstadt on the campus of Johannes Gutenberg University is studying electromagnetic processes in $e^+ e^-$ annihilation at the BES-III Experiment in Beijing. We extract the electromagnetic form factors of proton and neutron in the region of positive momentum transfer. In addition we prepare detector subsystems and physics analysis algorithms for the PANDA-experiment at FAIR (present start: 2026) in order to extract the time like form factors of the nucleon from antiproton-proton annihilation reactions.

We have the system responsibility for the electromagnetic calorimeter backward endcap of the PANDA-experiment. The backward endcap has passed the experiment readiness review and we plan to commission the backward endcap with a measurement at the MAMI accelerator in Mainz. We propose a measurement using the backward endcap calorimeter at the Mainz Microtron MAMI in order to measure the pion transition form factor at negative momentum transfer. This form factor can be related to one of the radiative corrections of the muon anomalous magnetic moment $(g-2)_\mu$, namely the hadronic light by light scattering (hLbL).

The postdoc candidate is required to participate in the setup of the experiment and the data acquisition system as well as to participate in the measurements and the subsequent data analysis.



In parallel data analysis of the ongoing BES-III experiment in Beijing is possible and will guarantee high impact publications. Participation in the PANDA experiment is desired.

Description of existing or sought Chinese collaboration partner institute (max. half page):

We have a very fruitful collaboration with the BES-III collaboration at the Institute of High Energy Physics (IHEP) in the Chinese Academy of Science (SICAS) and all partner institutions within the collaboration. We help operating the BES-III experiment as well as analysing the BES-III data. Our expertise lies in the field of nucleon structure observable like nucleon electromagnetic form factors. Collaboration on these subjects as well as experimental aspects is highly desired.

Required qualification of the post-doc:

- PhD in high-energy physics in the field on hadron physics, nucleon structure observables or charmonium spectroscopy or related areas is required.
- Experience with data acquisition systems as well as data analysis is required. Modern data analysis in high energy physics requires as well as some experience with simulation software packages like GEANT4. Experience in all these fields is required from the candidate.
- Additional skills in general aspects of experimental nuclear physics and experimental high-energy physics would be helpful but are not required.
- Language requirement: Good command of English language is mandatory for the collaboration in the project.