2018 HGF – GSI – OCPC – Programme

For the involvement of postdocs in bilateral collaboration projects

Part A:
Title of the project:
Development of the data processing framework for the CBM experiment
Helmholtz Centre and institute:
GSI Helmholtz Center for Heavy Ion Research GmbH
Project leader:
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https://www.gsi.de/work/forschung/cbmnqm/cbm.htm
Department: (at the Helmholtz centre or Institute)
CBM – Compressed Baryonic Matter
Contact Information: (Email, telephone and telefax)
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Description of the project :
The Compressed Baryonic Matter experiment (CBM) is a next-generation heavy-ion experiment which will investigate nuclear collisions in the FAIR energy range in order to explore the phase diagram of strongly interacting matter. A key feature of the CBM experiment is its ability to measure interaction rates of up to 10 MHz, which are unprecedented in the research field. To cope with this extreme rates, the data taking concept of CBM foresees real-time CPU processing of the entire data stream delivered by the detectors in order to identify and select event candidates potentially containing rare observables und thus suppress the raw data rate by several orders of magnitude before archiving. Online data processing will happen on a compute cluster build of commodity hardware. Fast and precise reconstruction algorithms are already under development. Currently, the CBM software framework, used for simulation, reconstruction and analysis, is based on the FairRoot software layer on top of ROOT as a platform. This system is not

well suitable for usage in real-time computing since it offers no inherent concurrency paradigm, such that the opportunities for parallel processing offered by contemporary computing architectures cannot be exploited.

The project described here aims at the development of a data processing framework which is suitable to be used both online and offline. A promising candidate is FairMQ, a message-queue based system which is developed by the Scientific Computing group at GSI as an extension of the existing FairRoot package. Within the project, the applicability of FairMQ for the CBM needs shall be investigated and, if positive, the necessary adaption of CBM software shall be performed. The candidate is expected to make major contributions to the corresponding developments and evaluations.

Description of existing or sought Chinese collaboration partner institute:

Candidates from Chinese CBM member institutes as well as from other institutes interested in a longer-term involvement in the CBM experiment are welcome.

CBM member institutes in China are:

- Beijing, Tsinghua University, Department of Engineering Physics
- Chongqing, Chongqing University
- Hefei, University of Science and Technology of China, Department of Modern Physics
- Wuhan, Central China Normal University, College of Physical Science and Technology
- Yichang, China Three Gorges University, College of Science

Required qualification of the post-doc:

- PhD in physics or computer science
- Experience with programming in C++ is indispensable. Knowledge in modern computer architectures and parallelisation techniques would be highly advantageous.
- Additional skills in software development infrastructure and work within a large experimental collaboration are desirable.

Part B:
Documents to be provided by the post-doc:
• Detailed description of the interest in joining the project (motivation letter) • Curriculum vitae (CV) • copies of degrees as a proof of education qualification • List of publications • 2 letters of recommendation
Part C:
Additional requirements to be fulfilled by the post-doc:
• PhD degree not older than 5 years • Very good command of the English language • Strong ability to work independently and in a team