



## 2020 HGF – GSI – OCPC – Programme

### for the involvement of postdocs in bilateral collaboration projects

**Title of the project:**

Development of the data processing framework for the frontier research experiment – CBM at Facility for antiproton and ion research.

**Helmholtz Centre and institute:**

GSI Darmstadt

**Project leader:**

Dr. Florian Uhlig

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**Description of the project (max. 1 page):**

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 and 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.



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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 adaptation 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 (max. half page):**

We have a very fruitful collaboration with Wuhan University and IMP and other institutes affiliated to CAS.

**Required qualification of the post-doc:**

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- **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.**

**The applicants shall submit the following documents to a Chinese postdoc station affiliated to a research institution or a university, after passing through the internal selection, the qualified application shall be forwarded to OCPC, and then to Helmholtz for evaluation:**

- Detailed description of the interest in joining the project (motivation letter)
- Curriculum vitae, copies of degrees
- List of publications
- 2 letters of recommendation
- Proof of command of English language
- Strong ability to work independently and in a team