



## 2025 Helmholtz – OCPC – Programme

for the involvement of postdocs in bilateral collaboration projects

### PART A

**Title of the project:**

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Axion-Like Particles at CMS

**DESY Division & Group:**

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FH-CMS

**Project leader/supervisor:**

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

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Axions were introduced in the 1980s in theories beyond the standard model (BSM) to address the strong CP problem. Axions and axion-like particles (ALPs) arise in many BSM scenarios that can be probed at the Large Hadron Collider (LHC) and are an important part of the local DESY program. For example, DESY is leading the search for ALPs with the ALPS II, MADMAX, (Baby)IAXIO, and LUXE experiments. In addition, there is an active theory community working on the same topic in Hamburg.

The postdoc's work will concentrate on searching for ALPs at the LHC, with a preferential focus on displaced signatures where ALPs are expected to appear. Along with the group at DESY, the postdoc will perform a search for a specific ALP signature with Compact Muon Solenoid (CMS) Run2 and Run 3 data. This search with the CMS detector will be the primary topic of their postdoc, and it will culminate in a paper in a peer-reviewed journal. While performing this search, the postdoc will be immersed in the DESY CMS group, which consists of about 90 members, making it the largest German institute in the CMS Collaboration. The DESY CMS group is engaged in activities ranging from physics analysis and contributions to data taking (monitoring and alignment) to detector hardware projects. CMS DESY physicists are experts in top quarks, the Higgs boson, Supersymmetry and Dark Matter Searches, QCD, as well as studies of parton density distributions in the proton. We also work on data quality monitoring, tracker alignment, the high level trigger, beam condition monitoring, as well as research and development for the tracker and high-granularity calorimeter upgrades. DESY is also a Tier 2 site and thus directly involved in the LHC computing for the data processing chain. As a direct result of all these activities of the group, the postdoc will have a plethora of learning opportunities and career development.



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

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Particle physics is a very collaborative and very international field, and the CMS Collaboration has partnerships and experimental collaborators from almost 200 universities and research institutions across China and the world. Within the CMS Collaboration, there are about 60 graduate students currently working on their doctorate in China. A postdoctoral position at a research institute like DESY would substantially improve the career perspectives for this group. In the CMS experiment collaboration, DESY works with 9 Chinese partner institutions (Beihang University, Beijing; Tsinghua University, Beijing; Institute of High Energy Physics, Beijing; Peking University, Beijing; Sun Yat-Sen University, Guangzhou; University of Science and Technology of China, Hefei; Fudan University, Shanghai, Zhejiang University, Hangzhou, Zhejiang).

**Required qualification of the postdoc:**

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- PhD in experimental particle physics or closely related field
- Demonstrated experience with data analysis
- Additional skills in hardware are a plus
- Good knowledge of spoken and written English
- Good oral and written communication skills as demonstrated by presentations and publications