# 2026 Helmholtz – OCPC – Programme

## for the involvement of postdocs in bilateral collaboration projects

**PART A**

**Title of the project:**

Studies of the electronic structure of interfaces of topological and novel magnetic materials by angle-resolved photoemission with synchrotron radiation

**Helmholtz Centre and/or institute:**

Helmholtz-Zentrum Berlin

**Project leader:**

Oliver Rader

**Contact Information of Project Supervisor:** (Email, telephone)

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https://www.helmholtz-berlin.de/forschung/oe/qm/spin-topologie/index_de.html

**Department:** (at the Helmholtz centre or Institute)

Department for spin and topology in quantum materials

**Programme Coordinator** (Email, telephone and telefax)

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

We are operating instruments for angle-resolved photoemission (ARPES) with spin resolution and at low temperature (1 K) with synchrotron radiation of variable light polarization and with pump-probe laser excitation. In addition, instruments for XMCD and soft-x-ray magnetic scattering under high magnetic vector fields and high resolution XMCD-PEEM are operated in our department.

For our in-house research we plan to strengthen our research in magnetism and topological materials. We have in the past studied topological insulators and semimetals and are aiming at extending this work to interfaces employing magnetic and superconducting proximity. We discovered recently the topological properties of the ferromagnetic topological-insulator heterostructure MnBi2Te4/Bi2Te3 and the ferromagnet topological insulator MnSb2Te4 (Rie19, Wim21). We plan to extend our work from MBE-grown bulk-like epitaxial films to magnetic and superconducting interfaces. Magnetic proximity aims at enhancing

the ferromagnetic Curie temperature of the magnetic material by an appropriate substrate. However in order to leverage topological effects in electric transport without shunting the device by a metallic substrate, a ferromagnetic insulator must be used. Additional constraints of epitaxial growth and perpendicular magnetic anisotropy narrow the number of possible material combinations further. We are experimenting with the interface of MnSb2Te4 and ferromagnetic insulating oxides (Luo26). Superconducting proximity aims at the realization of an interface that could be used as building block of a device for chiral 1D Majorana fermions which is one possible platform for fault tolerant quantum computing. Here, we study interfaces with NbSe2 and other superconductors.

Luo26 Chen Luo et al., to be published (2026)
Rie19 Rienks et al., Nature (2019)
Wim21 Wimmer et al., Adv. Mater. (2021)

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

The partner institute should have similar interest and ideally complementary expertise, such as lab based laser-ARPES or band structure theory or sample growth of topological or novel magnetic materials.

**Required qualification of the postdoc:**

- PhD in physics or materials science
- Experience with two of the fields: angle-resolved photoemission, MBE growth, laser pump-probe spectroscopy
- Additional skills ins surface preparation methods
- Language requirements: English