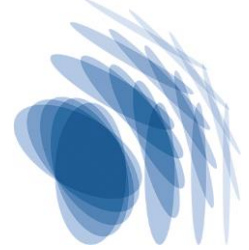


# Max-Planck-Institut für Struktur und Dynamik der Materie

Max Planck Institute for the Structure and Dynamics of Matter



IMPRS UFAST Call for PhD applications 2022/2023

PM1- Quantum phase change memories in Bismuth



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|---|---|
| <b>Title of PhD Project</b>                                       | <b>Quantum phase change memories in Bismuth</b>   |
| <b>Type</b>   | Experimental  |
| <b>Supervisor(s)</b>  | Prof. Philip Moll<br>Dr. Chunyu Guo   |
| <b>Affiliation(s):</b>  | Max Planck Institute for the Structure and Dynamics of Matter   |
| <b>Number of positions:</b>                                       | 1   |
| <b>Abstract:</b>  | <p>Bismuth remains one of the most enigmatic elemental conductors. The semi-metal is characterized by an ultra-low carrier density with almost perfect electron hole compensation. Even weak magnetic fields drive it into exotic regimes of electron transport, and the quantum limit can be reached conveniently at a few Tesla. Recent developments have tied its unusual behavior to a hidden topological anomaly in its band structure, depicting it as a “higher order topological insulator” (HOTI). These ideas provide a first attempt to separate high mobility bulk carriers from electrons at topologically protected surface states. Currently, this field is dominated by studies of macroscopic single crystals, while the bulk/boundary relations of such coupled topological systems clearly call for micron-sized samples with much larger surface participation in transport. In this project, you will develop a novel method to direct-write topological quantum wires into microscopic Bismuth samples using Focused Ion Beams. The nonlocal surface transport, following these wires, will be probed by magnetotransport at millikelvin temperatures. Disorder-driven transitions into superconducting states will further provide phase coherence to these structures, with the goal to explore Bismuth as a materials platform for quantum technologies.</p> |
| <b>Contact person for scientific questions about the project:</b> | Chunyu Guo – <a href="mailto:Chunyu.guo@mpsd.mpg.de">Chunyu.guo@mpsd.mpg.de</a>   |

