Thesis Project Offer

Joint Research and Education Programme "Palestinian-German Science Bridge PGSB"
Forschungszentrum Jülich GmbH & Palestine Academy for Science and Technology

Thesis type*

☐ BSc	☐ MSc	☒ PhD	Intended starting date (approx.): October 2023

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Project description*

THz spintronics is one of the top emerging directions in ultrafast spin dynamics science with enormous application potential in research and technology. The physical mechanisms driving the THz spintronic in ferromagnet/heavy metal (FM/HM) heterostructures include three main physical phenomena i) ultrafast demagnetization ii) inverse spin Hall Effect and iii) inverse Rashba-Edelstein effect. Following FM/HM heterostructure excitation with ultrafast laser pulses, the generated ultrafast spin currents are injected from FM into an adjacent HM layer. Subsequently, due to a large spin-orbit coupling, spin current transients are converted into transient charge currents which in turn, generate THz transients. Further enhancement of THz intensity and polarization control is expected using thin film nano-patterning and by introduction of novel 2D materials in the heterostructures. In this proposal, we aim to explore THz emission in novel heterostructures by including 2D materials and patterned structures. Generated THz will be in turn, employed in time-resolved THz spectroscopy of the novel quantum materials and molecular films integrated with the THz emitters. Further studies promise a plethora of new physical effects and fascinating science – an ideal research field for a scientist pursuing his or her MSc.

Date*	**Signature***
30.1.2023	

* required field

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