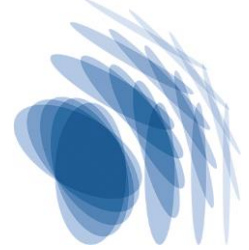


Max-Planck-Institut für Struktur und Dynamik der Materie

Max Planck Institute for the Structure and Dynamics of Matter



IMPRS UFAST Call for PhD applications 2022/2023



AR3- Foundations of Pauli-Fierz theory and quantum-electrodynamical density-functional theory

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| Title of PhD Project | Foundations of Pauli-Fierz theory and quantum-electrodynamical density-functional theory |
| Type | Theory |
| Supervisor(s) | Dr. Michael Ruggenthaler, Dr. Heiko Appel Prof. Angel Rubio |
| Affiliation(s): | Max Planck Institute for the Structure and Dynamics of Matter |
| Number of positions: | 1 |
| Abstract: | <p>Recent groundbreaking experiments have demonstrated that the quantized electromagnetic field can have a substantial impact on the dynamics and properties of molecules and solids even at ambient conditions. A detailed description of such situations necessitates the use of quantum electrodynamics (QED) in the non-perturbative low-energy regime. It has been established that the resulting Pauli-Fierz quantum-field theory is mathematically similar to quantum mechanics and can be based on a self-adjoint and bounded-below Hamiltonian.</p> <p>In this project the mathematical structure of the Pauli-Fierz Hamiltonian is to be further investigated and basic mathematical results for quantum-electrodynamical density-functional theory are to be established. A specific focus is on regularity results for the time evolution of the Pauli-Fierz Hamiltonian with external classical fields and the relation between the ultra-violet cutoff and mass renormalization.</p> |
| Contact person for scientific questions about the project: | Michael Ruggenthaler: michael.ruggenthaler@mpsd.mpg.de Heiko Appel: heiko.appel@mpsd.mpg.de Angel Rubio: angel.rubio@mpsd.mpg.de |

