

CONDENSED MATTER THEORY SEMINAR

Subject: **From a polaron into a cluster: the fate of an impurity in a Bose Einstein condensate**

Speaker: **Prof. Richard Schmidt (Universität Heidelberg)**

Date & time: **Friday, 27th of February 2023 at 3:15 p.m.**

Venue: **Room 01.114**

Zoom Link:

<https://uni-frankfurt.zoom.us/j/96520912647?pwd=NWZneE5XQmlwZFJlUXJpcUhdNEtKQT09>

Abstract

In ultracold atomic gases, a unique interplay arises between phenomena known from condensed matter, few-body physics and chemistry. Similar to an electron in a solid, a quantum impurity in an atomic Bose-Einstein condensate is dressed by excitations from the medium, forming a polaron quasiparticle with modified properties. At the same time, the atomic impurity can undergo the chemical reaction of three-body recombination with atoms from the BEC, which can be resonantly enhanced due to universal three-body Efimov bound states crossing the continuum. As an intriguing example of chemistry in a quantum medium, we show that such Efimov resonances are shifted to smaller interaction strengths due to participation of the polaron cloud in the bound state formation.

Simultaneously, the shifted Efimov resonance marks the onset of a polaronic instability towards the decay into larger Efimov clusters and fast recombination, offering a remarkable example of how chemistry can be modified in a quantum medium.