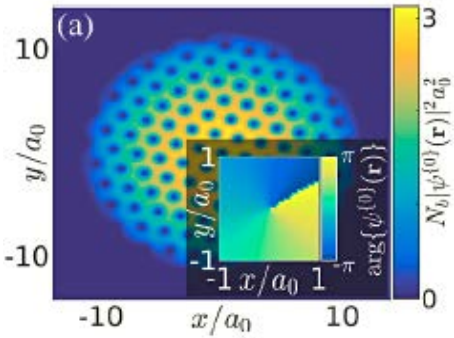
Research Highlight: Hubbard model and Bose-Einstein condensate
Work of Professor BAO Weizhu

Prof BAO Weizhu and co-authors developed a new Hubbard model for investigating cold bosonic impurity atoms trapped in a vortex lattice formed by a rotating Bose-Einstein condensate (BEC). In the bosonic Hubbard model for describing the dynamic of the impurities and their interaction with the BEC, it contains occupation-dependent parameters to capture the effects of strong impurity-impurity interactions, including both a repulsive direct interaction and an attractive effective interaction mediated by the BEC. The occupation dependence of these two competing interactions drastically affects the Hubbard model phase diagramme, including causing the disappearance of some Mott lobes. The model and its related theoretical results shed light on how to experimentally trap atomic impurities in a vortex lattice via a rotating BEC and hop impurities from one vortex to another in a vortex lattice.



Reference: T.H. Johnson, Y. Yuan, W. Bao, S.R. Clark, C. Foot, D. Jaksch, “Hubbard model for atomic impurities bound by the vortex lattice of a rotating Bose-Einstein condensate”. Physical Review Letters, 116, no. 24 (2016), article 240402.