ZOOM-Kolloquium - Habilitationsvortrag

Kolloquium

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Pseudospin- and spin-orbit coupled dynamics: from normal metals to Dirac systems

physikalisches

Mo. 18.1.21
16:00 Uhr
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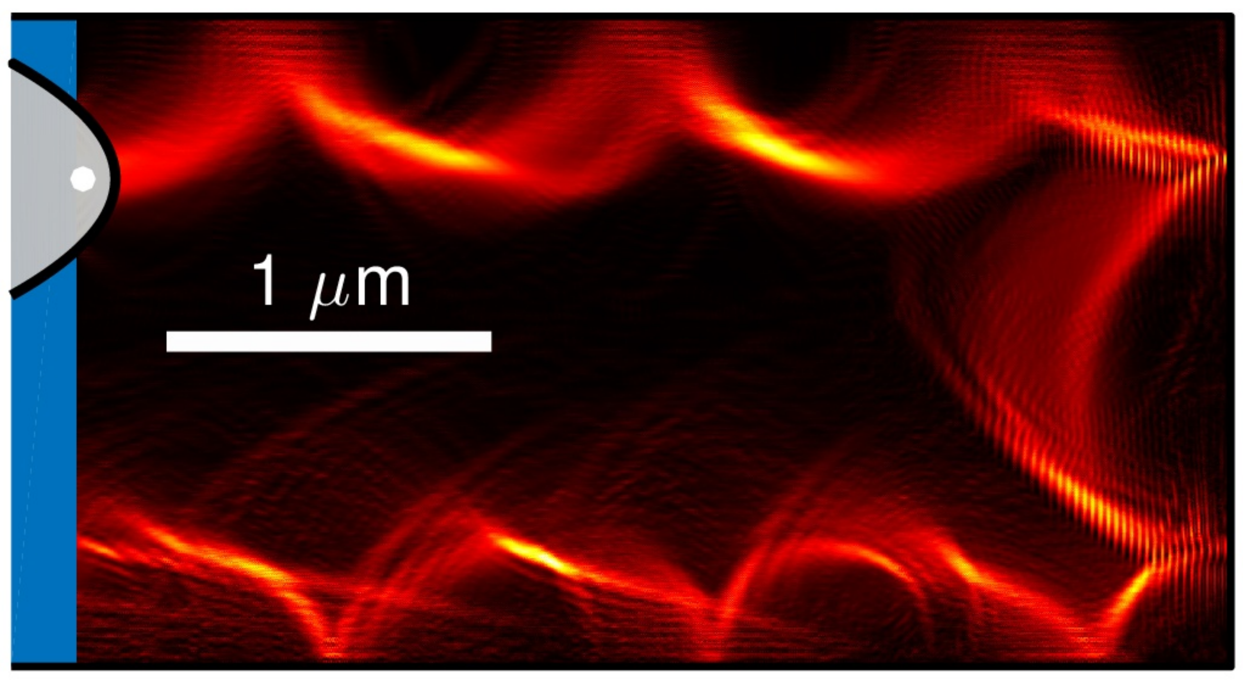
The dynamics of objects with internal structure is considerably more complex than, and qualitatively different from, that of point-like entities. The main culprit for the increased complexity is the coupling between orbital motion and internal dynamics.

This applies to big classical objects, such as two asteroids orbiting each other while travelling through space - a binary asteroid system - just as to tiny quantum entities, such as electrons. This might seem odd at first, since electrons lack any classically defined structure: as far as we can tell, they are point-like. They possess however a quantum structure, that is, a series of quantum numbers characterising their state. In the vacuum, this is limited to their intrinsic spin.

On the contrary, in a solid they generally acquire numerous emerging properties - in rough terms, they stop being naked electrons, and become dressed quasi-electrons. The coupling between their resulting internal pseudospin degrees of freedom and orbital motion can have critical consequences from zero up to room temperature, and in particular in Dirac systems, where orbit and pseudospin are "locked".



Pseudospin-orbit locking in graphene: Dirac electrons focused by effective negative refraction and Klein collimation perform a phase-coherent "quantum skipping orbit". Adapted from Phys. Rev. Lett. 118, 066801 (2017)

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