Physikalisches Institut
Fakultät für Mathematik und Physik
Albert-Ludwigs-Universität Freiburg

IRTG-Seminar

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“Excitonic Giant-Dipole States in Cuprous Oxide”

In this work [1] we predict the existence of a novel species of Wannier excitons when exposed to crossed electric and magnetic fields. In particular, we present a theory of giant-dipole excitons in cuprous oxide in crossed fields. Within our theoretical approach we perform a pseudoseparation of the center-of-mass motion for the field-dressed excitonic species, thereby obtaining an effective single-particle Hamiltonian for the relative motion [2]. For arbitrary gauge fields we exactly separate the gauge-dependent kinetic energy terms from the effective single-particle interaction potential. Depending on the applied field strengths and the specific field orientation, the potential for the relative motion of electron and hole exhibits an outer well at spatial separations up to several micrometers and depths up to 1 meV, leading to possible permanent excitonic electric dipole moments of around one million Debye. The calculated spectra possess spacings in the range of 20-100 micro-electronvolt while the bound excitonic giant-dipole states having binding energies of around 1 milli-electronvolt.

References

[1] M. Kurz, P. Grünwald, and S. Scheel, Phys. Rev. B **95**, 245205 (2017)

[2] O. Dippel, P. Schmelcher, and L.S. Cederbaum, Phys. Rev. A **49**, 4415 (1994)

Tuesday, December 19, 2017, 1:00 p.m., HS II,
Physics high rise, Hermann-Herder-Str. 3

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