PHYSIK

Physikalisches Kolloquium

Density and Spin Pattern Control in a Polaritonic Quantum Fluid

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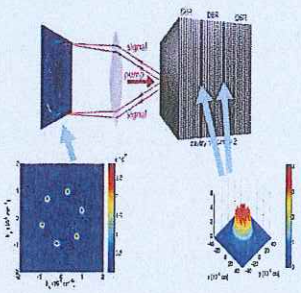
Polaritons in semiconductor microcavities are quasi-particles that are part photon and part exciton (electron-hole pair bound by Coulomb interaction). They combine the benefits of light and matter. Light, as part of a polariton, represents a built-in optical interface that allows for efficient optical detection and control, while excitons, representing the matter part of the polaritons, provide relatively strong spin-dependent interactions, which can in principle be harnessed for all-optical switching and gating operations. Polaritons can form a quantum fluid that exhibits a wide variety of nonlinear physical effects. One such effect, discussed in this talk, is that of transverse modulational instabilites, which can lead to pattern formation of the light emitted from the cavity [1-3], including stripes and hexagonal lattices in the near field, corresponding to two-spot and six-spot patterns in the far field (see figure). These polariton density patterns can be optically controlled (for example by changing the emission direction of a two-spot emission) and potentially lead to ultra-low energy architectures for all-optical classical computing. A deeper understanding of the pattern formation and control, including switching, can be based on the concept of non-equilibrium phase transitions, and modelled using population-competition models. In addition to polariton-density patterns, I will also discuss the optical control of spatial spin textures in polariton systems [5], which arise as a consequence of spin-orbit interaction (so-called optical spin Hall effect). The presentation of the theoretical concepts will be complemented by experimental results that demonstrate control of polaritonic density patterns and of the optical spin Hall effect.

[1] V. Ardizzone et al., Scientific Reports 3, 3016 (2013)
[2] S. M. H. Luk et al., Phys. Rev. Lett. 119, 113903 (2017)
[3] P. Lewandowski et al., Optics Express 25, 31056 (2017)
[4] Y.C. Tse et al., New J. Phys. 17, 083054 (2015)
[5] O. Lafont et al., Appl. Phys. Lett. 110, 061108 (2017)



Der Gast wird betreut von Herrn Prof. Dr. Schneider
Gäste sind herzlich willkommen
Kaffeeausschank ab 17:00 Uhr

Montag, 11.06.2018, 17:15 Uhr
Gebäude 46, Hörsaal 270

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