Faculty of Science
Department of Physics

Colloquia

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Polaritons in two dimensional electron systems

day	location	time
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ABSTRACT

Cavity-polaritons have emerged as an exciting platform for studying interacting bosons in a driven-dissipative setting. Typically, the experimental realization of exciton-polaritons is based on undoped GaAs quantum wells (QW) embedded in between two monolithic distributed Bragg reflector (DBR) layers. Introduction of a degenerate electron gas either to the QW hosting the excitons or a neighboring layer substantially enriches the physics due to polariton-electron coupling. It has been proposed that such an interacting Bose-Fermi mixture can be used to study polariton-mediated superconductivity in a two dimensional electron gas.

Transition metal dichalcogenide (TMD) monolayers, such as molybdenum diselenide (MoSe2), represent a new class of valley semiconductors exhibiting novel features such as strong Coulomb interactions, finite exciton Berry curvature with novel optical signatures and locking of spin and valley degrees of freedom due to large spin-orbit coupling. In contrast to quantum wells or twodimensional electron systems in III-V semiconductors, TMD monolayers exhibit an ultra-large exciton binding energy of order 500 meV and strong trion peaks in photoluminescence that are red-shifted from the exciton line by 30 meV. In this talk, I will present cavity spectroscopy of gate-tunable monolayer MoSe2 exhibiting strongly bound exciton-polaron and trion resonances, as well as non-perturbative coupling to a single microcavity. Our findings constitute a first step in investigation of a new class of degenerate Bose-Fermi mixtures consisting of polaritons and electrons.

Atac Imamoglu graduated with PhD from Stanford University in 1991. His PhD thesis was on the proposal and first demonstration of electromagnetically induced transparency. He was on the UC Santa Barbara faculty between 1993 and 2002. In 2003 he moved to ETH Zurich as a Professor of Physics. He works on quantum optics and condensed matter physics.

The Physics Colloquia are designed to address a non-specialist, broad audience and introduce topics of contemporary research through lectures by leading experts. We warmly invite all members of the student body, including undergraduates enrolled in any programme.