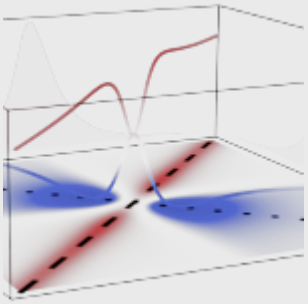
Thesis Defense - Reaching Quantum Polaritons



Place: Sala de Grados, Módulo 8.
When: 10:30, Tuesday, 20 December, 2016.
Program: Defense by Ms. Blanca Silva Fernández, Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.
Title: Reaching Quantum Polaritons.
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The strong coupling between light and matter (excitons) gives rise to the so-called *exciton-polaritons*, which are the central topic of this thesis. Given their nature, they enjoy properties of both elements: low mass and high speed due to their photonic component and strong inter-particle interactions due to the excitonic one. The mixture of all these properties makes them perfect candidates for the study of some of the most interesting research areas in quantum physics such as quantum cryptography or quantum computation. However, to be deployed at the ultimate quantum limit, the genuine single-polariton regime must be achieved. Until now, this important line of research for multiple groups in the field of semiconductor quantum optics has remained an open task. In this thesis we present, in a combined theoretical and experimental effort, several approaches towards our main purpose of “reaching quantum polaritons”. In a first attempt, although still within a classical picture, we find a fundamental characterization of photon correlations when including their energy degree of freedom, thus extending and generalizing the textbook Hanbury Brown-Twiss correlations. With our second attempt, pioneering a new paradigm of exciting with quantum light, we demonstrate the long-sought regime of non-classical states of the polariton field. With these results, we believe we open a new line of research in polaritonics, to which we invite everyone!