Polaritonic Spinor interactions and Feshbach Resonance.

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In this talk, I will review the recent measurements of the strength of spinor interactions in microcavity polaritons. In particular, I will detail the observation of the Feshbach resonance at the crossing of the lower polariton energy with the biexciton energy.

The experiments that have been performed are co and counter-circular polarized heterodyne pump-probe spectroscopy. We first measure the shift of both the lower and upper polaritons at zero delay for different detunings under co-circular excitation. The spinor interactions are shown to depend on the exciton fraction of the polariton for both the lower and upper polaritons. On the contrary, the ratio of the co and counter circular interactions does not follow a straightforward dependence. This is evidence for the counter polarized resonant scattering due to the Feshbach resonance.

It shows :

(i) a shift of the lower polariton interaction strength and

(ii) a reduction of the lower polariton absorption.

Both observables are sensitive to the energy difference between the polariton and biexciton states, which is determined by the cavity detuning.

We perform numerical simulations based on a mean field two-channel model, which reproduce our observations with great accuracy, and in particular the very complex delay maps. Calculations are carried out both in the polariton basis and in the exciton-photon basis.

The experiments and the modeling have been performed by Naotomo Takemura, Stéphane Trebaol, Michiel Wouters, and Marcia Portella-Oberli.