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Multidimensional spectroscopy of exciton polaritons in a microcavity BRIAN WILMER, Department of Physics, West Virginia University, FELIX PASSMANN, Experimentelle Physik 2, TU Dortmund, MICHAEL GEHL, GALINA KHITROVA, College of Optical Sciences, The University of Arizona, ALAN BRISTOW, Department of Physics, West Virginia University, WEST VIRGINIA UNIVERSITY COLLABORATION, TU DORTMUND COLLABORATION, UNIVERSITY OF ARIZONA COLLABORATION — Two-dimensional coherent spectra map the anticrossing associated with normal-mode splitting in a semiconductor microcavity [1]. For a 12-meV detuning range near zero detuning, it is observed that there are two diagonal features related to the intra-action of exciton-polariton branches and two off-diagonal features related to coherent interaction between the polaritons. A biexcitonic companion feature is observed, shifted from the exciton feature by the biexciton binding energy. Closer to zero detuning, all features are enhanced and the diagonal intra-action features become nearly equal in amplitude and linewidth. Off-diagonal interaction features are strongly modulated (and invert) at small positive detuning, as the lower polariton branch crosses the bound biexciton energy determined from negatively detuned spectra. This Feshbach type behavior is further evidenced by strong polarization dependence. By exploiting selection rules, the quantum pathways can be more rigorously controlled, allowing the Feshbach coupling to be switched on an off as well as elucidating the role spin and two-quantum states play in the exciton-polariton system.
[1]. Wilmer et al, Phys. Rev. B 91, 201304(R) (2015)

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