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Magnetic-field evolution of collective excitations in Al-GaAs/GaAs few-electron quantum dots in the mK regime. SOKRATIS KALLIAKOS, CESAR PASCUAL GARCIA, VITTORIO PELLEGRINI, NEST CNR-INFM and Scuola Normale Superiore, Pisa, Italy, ARON PINCZUK, Dept of Physics, Dept of Appl. Phys. and Appl. Math., Columbia University, New York, New York, BRIAN S. DENNIS, LOREN N. PFEIFFER, KEN W. WEST, Bell Labs, Lucent Technologies, Murray Hill, New Jersey, MASSIMO RONTANI, GUIDO GOLDONI, ELISA MOLINARI, S3 CNR-INFM and Università degli Studi di Modena and Reggio Emilia, Modena, Italy — Spin transitions and interactions in few-electron quantum dots (QDs) are investigated by resonant inelastic light scattering (ILS). Here we present the observation of inter-shell excitations in GaAs/AlGaAs QDs that are fabricated by combining e-beam nano-lithography with high quality reactive ion etching. The interpretation of the experimental results by numerical evaluations within a full configuration interaction approach highlights the importance of the exchange and correlation effects in these systems. We show that, under the impact of a perpendicular magnetic field, the evolution of electronic spin and charge inter-shell excitations at mK temperatures reveal that significant changes in the ground state occur even at moderate magnetic fields. These experiments demonstrate that ILS enables the study of few-electron effects in QDs under the extreme conditions of low temperatures and high magnetic fields.

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