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Output Polarization Characteristics of an Electrically Injected Quantum Dot Spin Polarized Single Photon Source[1] AYAN DAS, JUNSEOK HEO, DEBASHISH BASU, WEI GUO, PALLAB BHATTACHARYA, Solid State Electronics Laboratory, University of Michigan, Ann Arbor — The fine structure of the excitons in a quantum dot, its dependence on the confinement symmetry of the dot and on externally applied electric or magnetic field have been a subject of interest in recent years. We have studied these effects in an electrically injected quantum dot spin polarized single photon source. The GaAs-based microcavity diode consists of a single InAs/GaAs self organized quantum dot as the single photon source and a MnAs/$Al_{0.1}Ga_{0.9}As$ Schottky tunnel barrier as the spin injector. Single photon emission from the device is confirmed by antibunching behavior in photon correlation measurements. The output circular polarization of the exciton emission, measured in the Faraday geometry, remains zero upto a field of ~ 0.9 Tesla and then increases to 8%. The output linear polarization shows a complementary trend. The results are explained on the basis of the observed in-plane anisotropy of the quantum dots due to epitaxy-related effects and the Zeeman interaction of electron and hole spins and their effect on the optical transitions of excitons involving mixed and pure states.

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Ayan Das
SSEL, Department of EECS, University of Michigan, Ann Arbor

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