Single Fluorine Impurities in ZnSe: Magnetospectroscopy and Spin Qubit Applications
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— We report on the optical detection and investigation of single donors in ZnSe. By isolating the donors in quantum well mesas, we are able to probe them individually using magnetospectroscopy in both Voigt and Faraday geometry. The structure of interest is the electron bound to a $^{19}\text{F}$ neutral donor, which has been proposed as a strong candidate for a semiconductor-based qubit. The donor electron is optically accessible through the bound exciton transition, allowing the possibility of ultrafast optical spin control and detection. We present our recent spectroscopic and $g^2(0)$ experimental results and discuss their spin qubit applications.