

## Enhancing Quantum Dot-Waveguide Chiral Coupling with Optimized Polarization

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### Abstract

We demonstrate that optimizing quantum dot (QD) polarization in photonic crystal waveguides enhances chiral coupling, achieving 60% spatially averaged directionality while overcoming random QD positioning limitations in epitaxy. Elliptical polarization enhances high-directionality regions compared to circular polarization and improves their overlap with Purcell-enhanced areas.  $k \cdot p$  modeling confirms that neutral excitons in realistic QDs attain this optimal polarization under weak (0.15 T) magnetic fields.