Waveguide QED – from Quantum Nonreciprocity to Dimerized Entanglement

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Waveguide quantum electrodynamics provides a cavity free route to strong light matter interaction, where propagating photons in a one- dimensional channel interact strongly with quantum emitters. We survey [1-3] how chirality, interference, and engineered environments in waveguide platforms enable tunable transparency, direction dependent interactions, quantum nonreciprocal transport, and steady state dimerized entanglement. The latter can also result by using resonant qubits interacting with superradiant environment.

References

[1] D Mukhopadhyay and Girish S Agarwal, Phys. Rev. A **101**, 063814 (2020)

[2] Q Miao and G S Agarwal, Phys. Rev. Res. **7**, 013138 (2025)

[3] Z Zhang, Q Miao and G S Agarwal, Phys. Rev. Res. **8**, 013336 (2026)