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**Quantum dynamics of a crossed cavity EIT system**[1] BERTUS JORDAAN, PHUONG NGUYEN, CARL CHEUNG, CHRIS IANZANO, CONNOR KUPCHAK, EDEN FIGUEROA, Stony Brook University — While much experimental progress has been made towards achieving quantum devices operating with single qubits, the development of light-matter nodes in which deterministic two-qubit gates can be realized still remains an elusive goal. This is due to the difficulty to create strong photon-photon interactions. A possible solution to this challenge is the experimental implementation of multiple cavity modes strongly coupled to the same atomic ensemble. In this work we investigate the combined effects of cavity quantum electrodynamics (CQED) and electromagnetically induced transparency (EIT) in a doubly coupled light-matter system. We have simulated EIT-based N- and M-type atomic schemes in which few-photon level probe and signal fields are both strongly coupled to an atomic ensemble. The dynamics of the system is obtained numerically by solving the Lindblad master equation for the atom-cavities density operator. We will also show our experimental progress towards the implementation of this system using a rubidium ensemble simultaneously coupled to two optical cavities.

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