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**Quantum Dot Molecule Polaritons and a Voltage-Tunable Vacuum Rabi Splitting** PATRICK VORA, George Mason University, ALLAN BRACKER, SAMUEL CARTER, Naval Research Laboratory, MIJIN KIM, Sotera Defense Solutions, Inc., CHUL SOO KIM, SOPHIA ECONOMOU, DANIEL GAMMON, Naval Research Laboratory — InAs quantum dots (QDs) are a popular system for realizing quantum information protocols and studying cavity-QED. An additional class of optical transitions can be accessed by using quantum dot molecules (QDMs): a pair of tunnel-coupled QDs. Recombination can occur within one of the QDs (intradot) or across the tunnel barrier (interdot). Interdot transitions are typically weaker due to reduced wavefunction overlap. Recently, our team embedded a QDM within a GaAs photonic crystal cavity and demonstrated photonic enhancement of a singlet-triplet qubit. Here, we realize a strongly-coupled cavity-QDM system and demonstrate cavity-QED effects inaccessible in single QDs. These include the first observation of molecular polaritons in InAs QDs and a voltage-tunable vacuum Rabi splitting ($2g$). The tunable vacuum Rabi splitting can only occur in QDMs and provides an advantage as $g$ is typically fixed post-fabrication. This flexibility could be useful for optical signal processing schemes that exploit the anharmonicity of the Jaynes-Cummings ladder.

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