Rydberg Interactions in a High Finesse Optical Cavity

YUANXI CHAO, AKBAR JAHANGIRI, JAMES SHAFFER, University of Oklahoma — We present progress on our light-Rydberg atom interaction experiment in a high finesse optical cavity, $\sim 28000$. We studied cavity assisted Rydberg electromagnetically induced transparency (EIT) in the presence of an interactivity electric field of $\sim 2$ V/cm and a magnetic field of $\sim 1$ G. We access Rydberg states with principle quantum numbers $n > 50$ to study dipole blockade. We show the theoretical and experimental results for our system under such intracavity fields, where the Rydberg blockade excitations can strongly couple to the cavity modes. $n > 50$ is suggested by our pair interaction calculations so that we can observe Rydberg-Rydberg interactions and form superatoms inside our cavity. The Rydberg atom-cavity system can be useful in controlled photon generation for quantum information processing.