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**Rydberg Transitions and Interactions in a High Finesse Optical Cavity**[1] YUANXI CHAO, AKBAR JAHANGIRI, JAMES SHAFFER, University of Oklahoma — We report on our work on Rydberg atom-light interaction inside a high-finesse optical cavity. Rubidium atoms are cooled and trapped in a 3-D magneto-optical trap and then transported into a cavity with a finesse of around 28000 using a focus-tunable lens. The atoms inside the cavity are excited into the Rydberg state via a two-photon transition. Cavity assisted Rydberg electromagnetically induced transparency with a three-peak structure is observed. Using this signal, we estimated the intracavity magnetic and electric fields. By adding an external magnetic field to our Rydberg atom-cavity system, we determined the coherence time to be 7.26 microseconds with the 35S Rydberg state of rubidium [1]. Work at higher principle quantum numbers where Rydberg blockade is relevant will also be presented, including pair interaction calculations that support our results. [1] J. Sheng, Y. Chao, S. Kumar, H. Fan, J. Sedlacek, and J. P. Shaffer, Phys. Rev. A 96, 033813 (2017).

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