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**Rydberg Excitation in a Sr BEC** B.J. DESALVO, J.A. AMAN, X. ZHANG, T. LANGIN, F.B. DUNNING, T.C. KILLIAN, Rice University — Despite its apparent simplicity, the system of Rydberg atoms immersed in a Bose Einstein Condensate (BEC) is surprisingly rich and is the subject of numerous theoretical proposals. We present experimental studies of this system in which atoms from a BEC of neutral Sr are excited to the  $5sns^3S_1$  Rydberg series via two photon excitation through the metastable  $^3P_1$  state. We will describe studies of the interactions between Rydberg and background BEC atoms and our progress towards experiments with Rydberg dressing. Alkaline-earth metal atoms offer many new opportunities for these studies, such as an optically active core electron which can be used to manipulate and detect Rydberg atoms. In comparison to two photon excitation schemes using only dipole allowed transitions, the narrow linewidth of the  $^1S_0 - ^3P_1$  transition allows for the attainment of larger Rabi frequencies for the same loss rate due to spontaneous emission.

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