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Spatial and Temporal Correlations in a Cold-Atom Rydberg-EIT System MICHAEL VIRAY, STEPHANIE MILLER, GEORG RAITHEL, University of Michigan — Cold atoms in a Rydberg-electromagnetically-induced-transparency (Rydberg-EIT) system are known to be strongly correlated, both spatially and temporally. Spatial correlations are due to the Rydberg blockade effect, while temporal correlations stem from, in addition to Rydberg blockade, the highly dispersive nature of EIT and propagation of Rydberg polaritons through the atomic medium. While these two sets of correlations have been studied individually, an analysis of their interplay would greatly benefit from simultaneous measurement of spatial and temporal correlations in one system. Our experiment investigates simultaneous spatial and temporal correlations of cold rubidium-87 atoms in a Rydberg-EIT configuration. To measure spatial correlations, we use a highly magnifying atom imaging apparatus that allows us to extract the spatial $g^{(2)}(x, y)$ in the imaging plane. The temporal correlation function $g^{(2)}(t)$ is obtained using a single photon counting module (SPCM). We discuss the experimental methods used and report our initial experimental results.

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