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Imaging spatial correlations of Rydberg excitations in cold atom clouds[1] ANDREW SCHWARZKOPF, RACHEL SAPIRO, GEORG RAITHEL, U. of Michigan — Previously, Rydberg excitation blockades have been shown to cause a saturation of Rydberg excitation numbers in atom samples and a narrowing of the excitation number statistics, and they have been employed in quantum information experiments. In the experiment described in this talk, we present measurements of structures in the Rydberg pair correlation function similar to those predicted in.[2] To achieve sufficient spatial magnification, we use the principle of field ion microscopy. A tungsten tip is placed close to a cold atom cloud in which several Rydberg excitations are prepared using a narrow-linewidth laser. To read out the sample, the tip voltage is suddenly switched to a high value. The Rydberg atoms are field-ionized, and the resultant ions are projected onto a nearby position-sensitive detector. We present the dependence of the pair correlation function on the principle quantum number and other parameters.

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[2]F. Robicheaux and J. Hernandez, "Many-body wave function in a dipole blockade configuration," Phys. Rev. **A 72**, 63403, 1-4 (2005).

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