Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Probing a strongly interacting bose mixture with ultralong-range Rydberg molecules[1] J. D. WHALEN, S. K. KANUNGO, Y. LU, F. B. DUNNING, T. C. KILLIAN, Rice Univ — Recent work has shown that photoexcitation of ultralong range Rydberg molecules (ULRRMs) proivdes an *in situ* probe of spatial correlations in quantum gases. The excitation rate of the ground-state dimer ULRRM is proportional to the nonlocal pair correlation function $g^{(2)}(R)$, with R tunable from roughly $1400 - 3200\ a_0$ by changing the principal quantum number, n, of the target Rydberg state [1]. At these length scales, the pair correlation function for a weakly interacting gas is largely determined by the thermal de Broglie wavelength and the symmetry of the many-body wavefunction under particle exchange. In the presence of strong interparticle interactions, however, $g^{(2)}(R)$ reflects the shape of the scattering wavefunction at short range, and a node in the wavefunction leads to a zero in the pair-correlation function at a separation around the s-wave scattering length, a_s. We present measurements of the excitation rate of ULRRM dimers in a strongly interacting mixture of ^{88}Sr and ^{84}Sr ($a_s = 1800\, a_0$) and progress in our efforts to observe the effect of strong interactions on the pair correlation function $g^{(2)}(R)$.

[1] J. D. Whalen, et al. Phys. Rev. A **100**, 011402(R)

[1]Research supported by Air Force Office of Scientific Research award FA9550-17-1-0366 and Welch Foundation award C-1844

Joseph Whalen
Rice Univ

Date submitted: 23 Jan 2020 Electronic form version 1.4