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Ion Temperature and Expansion Velocity Measurements Through Fluorescence Imaging in Ultracold Neutral Plasmas JOSE CASTRO, HONG GAO, PRIYA GUPTA, SAMPAD LAHA, CLAYTON SIMIEN, THOMAS KILLIAN, Department of Physics and Astronomy and Rice Quantum Institute, Rice University, Houston, TX 77005 — Imaging probes in Ultracold Neutral plasmas are used for studying strongly coupled systems. Doppler broadening of the light-scattering spectrum provides information on ion temperature and velocity. Absorption imaging shows Doppler broadening due to the combined effects of the radially directed expansion velocity and the random thermal motion of the ions. To distinguish these two quantities, fluorescence imaging of Ultracold Neutral Plasmas is used to produce a spatially-resolved spectrum that is Doppler-broadened due to thermal ion velocity and shifted due to ion expansion velocity.

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