Energy-dependent 3-body loss in 1D Bose gases NEEL MALVA-
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DAVID S. WEISS, The Pennsylvania State University — We study atom loss in
high density quantum Newton's cradles (QNCs) with a range of energies and trans-
verse confinements and find that it is strongly energy dependent. A center-of-mass
energy (E_{cm}) dependent 3-body loss rate, $K_3^{1D}(E_{cm})$, has been predicted for a one-
dimensional Bose gas [1], but has not previously been observed. We adapt the 1D
theory to quasi-1D gases using the assumption that the loss rate never exceeds the
3D value. Using precise measurements of the QNC momentum distributions and a
semiclassical approximation, we infer the E_{cm} of all 3-body collisions that occur in
the system. We then compare the calculated losses as a function of time to the ob-
served losses, doing a least squares fit of two free parameters using 48 decay curves.
The model conforms well with our experimental results [2]. [1] Mehta, N. P., Esry,
B. D. & Greene, C. H. Three-body recombination in one dimension. *Phys. Rev.
A.* **76**, 022711 (2007). [2] Zundel, L. A. et al., Energy-dependent 3-body loss in 1D
Bose gases. *Phys. Rev. Lett.* **122**, 013402 (2019).

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