

Abstract Submitted  
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**Effects of tunneling on three-body collisions in atom waveguides<sup>1</sup>**

VLADIMIR YUROVSKY, Tel Aviv University — Atoms with zero-range interactions under a tight transverse confinement in an atom waveguide [1] realize the integrable Lieb-Liniger-McGuire (LLMG) model. Conservation of the quasi-momentum set in this model manifests in the absence of thermalization in the quantum Newton cradle experiment [2] with a two-dimensional optical lattice a set of parallel atom waveguides. Thermalization was observed in the recent experiment [3] due to dipole-dipole interactions, distorting the LLMG model. The present work analyses integrability lifting due to tunneling between neighboring waveguides. This effect can already take place in the case of three atoms in two waveguides. The three-body scattering problem is solved in the second order Born approximation over the interactions between atoms. Unlike the LLMG model, where the atoms can only exchange their momenta, the system becomes diffractive, i.e. the set of atom momenta is changed as a result of scattering. 1. V. A. Yurovsky, M. Olshanii, and D. S. Weiss, *Adv. At. Mol. Opt. Phys.* 55, 61 (2008). 2. T. Kinoshita, T. Wenger, and D. S. Weiss, *Nature (London)* 440, 900 (2006). 3. Y. Tang, W. Kao, K.-Y. Li, S. Seo, K. Mallayya, M. Rigol, S. Gopalakrishnan, and B. L. Lev *Phys. Rev. X* 8, 021030 (2018).

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