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Momentum relaxation of a mobile impurity in a one-dimensional quantum gas OLEKSANDR GAMAYUN, EVGENI BUROVSKI, VADIM CHEIANOV, OLEG LYCHKOVSKIY, Lancaster University — We investigate the time evolution of the momentum of an impurity atom injected into a degenerate Tonks-Girardeau gas. We establish that given an initial momentum p_0 the impurity relaxes to a steady state with a non-vanishing momentum p_∞. The nature of the steady state is found to be drastically different for integrable and non-integrable impurity models, which is due to multiple coherent scattering processes leading to a resonant interaction between the impurity and the host in the integrable case. The dependence of p_∞ on p_0 remains non-trivial even in the limit of vanishing interaction between the impurity and host particles. In this limit $p_\infty(p_0)$ is found explicitly and the case of the external force applied to the impurity is analyzed as well.

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