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Non-equilibrium dynamics of an impurity in the one-dimensional Bose gas NEIL ROBINSON, ROBERT KONIK, Brookhaven National Lab — In recent years, the out-of-equilibrium dynamics of interacting many-body quantum systems have attracted much attention. Integrable quantum models have played an important role in understanding the role of local conservation laws in the relaxation of observables, explaining unusual experimental observations in the one-component Bose gas [1]. We study the non-equilibrium dynamics of "impurity" wave packets containing a single boson propagating in the one-component Bose gas. Utilizing the integrability of the multi-component Lieb-Liniger model and recent results from the algebraic Bethe ansatz [2], we compute the time-evolution of the density profile of the "impurity" in the cases where the bosons is of the same or different species as the background gas. Our method, based upon numerically solving the Bethe ansatz equations and evaluating the Lehmann spectral representation for local observables, allows us to reach long times with high numerical precision. By comparing results from the two-component Lieb-Liniger model to the one-component Bose gas we can comment on the role of distinguishability in the dynamics of impurities in integrable models.

[1] T. Kinoshita *et al.*, Nature **440**, 900 (2006).
[2] B. Pozsgay *et al.*, J. Phys. A **45**, 465007 (2012).

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