Nonlinear Behaviour in Long Range Integrable Models with Spin
MANAS KULKARNI, Stony Brook University and Brookhaven National Laboratory, FABIO FRANCHINI, The Abdus Salam ICTP (Trieste), ALEXANDER ABANOV, Stony Brook University — We study nonlinear aspects of long range integrable models with spin by going beyond the Luttinger Liquid theory. We present here [1], the fully nonlinear dynamics of spin and charge in spin-Calogero model (sCM), an integrable 1D model of quantum spin-1/2 particles interacting through inverse square interaction and exchange. Hydrodynamic equations of motion are written for this model in the regime where gradient corrections to the exact theory may be neglected. In this approximation, variables separate in terms of dressed Fermi momenta of the model. Hydrodynamic equations reduce to a set of decoupled Riemann-Hopf equations for the dressed Fermi momenta. We study the dynamics of some non-equilibrium spin-charge configurations for times smaller than the timescale of gradient catastrophe. We then show [2] how this field theory allows to calculate correlation functions that cannot be considered with conventional bosonization. We also highlight the connections between sCM, Haldane-Shastry model and $\lambda = 2$ spin-less Calogero model. [1] M. Kulkarni, F. Franchini, A. G. Abanov, Phys. Rev. B 80, 165105 (2009) [2] F. Franchini, M. Kulkarni, Nucl. Phys. B, 825, 320 (2010)

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