1088-35-18 **Maxim Olshanii*** (maxim.olchanyi@umb.edu), University of Massachusetts Boston, 100 Morrissey blvd., Boston, MA 02125, **Zaijong Hwang** (zaijong.hwang001@umb.edu), University of Massachusetts Boston, 100 Morrissey blvd., Boston, MA 02125, and **Andrew Koller** (andrewpkoller@gmail.com), JILA University of Colorado 440 UCB, Boulder, CO 80309. *On a relationship between reflectionless potentials, Lax operators, Bogoliubov-de Gennes Liouvillians of integrable PDEs, and supersymmetric chains.* Preliminary report.

We look at several instances of refectionless scattering, the evolution of a two-level atom under a sech(t) laser pulse in particular. For each of them, we analise its connection to three other objects: an integrable PDE for whom a given reflectionless scatterer serves as a Lax opearator, another integrable PDE whose linear stability analysis equation (LSA) is represented by the above scatterer, and a trivial linear equation with constant coefficients to which the scatterer is linked via a so-called *intertwiner* or via a supersymmetric (SUSY) chain.

In particular, the sech(t) problem mentioned above shows a rich SUSY structure [Koller & Olshanii, Physical Review E 84, 066601 (2011)]; at the same time it serves as a Lax operator for a class of n-soliton solutions of both Nonlinear Schrödinger (NLS) and sine-Gordon (sG) equations. LSA around single soliton solutions of the sG, NLS and Korteweg–de Vries (KdV) equations exhibit reflectionless scattering; furthermore, they can be shown to have an interwining property, extendable to SUSY in the sG case. Finally, there is an intriguing possibility that known cases of reflectionless scattering, when regarded as LSA, can be used to discover previously unknown integrable PDEs. (Received December 14, 2012)