1112-35-591 **Zhiwu Lin*** (zlin@math.gatech.edu), 686 Cherry St., School of Mathematics, Georgia Institute of Technology, Atlanta, GA 30332, and **Chongchun Zeng**, 686 Cherry St., Atlanta, GA 30332.

Instability index, exponential trichotomy and invariant manifolds for Hamiltonian PDEs.

Consider a general linear Hamiltonian system $u_t = JLu$ in a Hilbert space X, called the energy space. We assume that L induces an symmetric bi-linear form $< L., . >$ on X, and the energy functional $< Lu, u >$ has only finitely many negative dimensions $n(L)$. The anti-selfadjoint operator J can be unbounded and even with an infinite dimensional kernel space. First, we proved an index theorem relating $n(L)$ and the dimensions of generalized eigenspaces of eigenvalues of JL, some of which may be embedded in the continuous spectrum. Our second result is the linear exponential trichotomy of the evolution group e^tJL. In particular, we prove the nonexistence of exponential growth in the finite co-dimensional center subspace and the optimal bounds on the algebraic growth rate there. This is applied to construct the local invariant manifolds for nonlinear Hamiltonian PDEs near the orbit of a coherent states (steady state, traveling waves etc.). We will discuss applications to examples including dispersive long wave models such as BBM, KDV and good Boussinesq equations, Gross-Pitaevskii equation for superfluids, 2D Euler equation for ideal fluids, and 3D Vlasov-Maxwell systems for collisionless plasmas. This is a joint work with Chongchun Zeng. (Received August 11, 2015)