# A Possible Quantum Filter

朱家誼 (C.-Y. Ju)

*Department of Physics at NCHU*

## Abstract

One of the central ingredients that characterizes a quantum system is the set of eigenstates to the Hamiltonian. Although bound states are, obviously, discrete eigenstates of the Hamiltonian, by no means they are the only possible eigenstates. Scattering states, which are asymptotically free at spatial infinity, also form a (continuous) subset of the eigenstates. These states do not belong to Hilbert space since they are not square integrable and, hence, are different from bound states. However, under some circumstances, when the time axis is extended from real to complex, a few scattering states become bound states after analytic continuation. Some evidences can be found from the resonances (poles) of scattering matrices. A physical consequence of the resonances is that they suppress the frequencies away from the resonant frequency, which leads to a possible frequency filter.