DOMENICO MONACO, Università degli Studi di Roma Tre  
*Derivation of a Kubo-like formula for charge and spin transport*

We study the linear response of a gapped periodic quantum system to a small electric field, modelled by a potential $\varepsilon X_j$, $\varepsilon \ll 1$, by measuring the conductivity $\sigma_{ij}$ of a current operator in the form $J_i = i[H_0, S X_i]$, where $H_0$ is the Hamiltonian of the unperturbed system and $S$ is an operator acting on the internal degrees of freedom only (e.g. on spins). This is of relevance for 2-dimensional quantum (spin) Hall systems, where $S$ is the identity operator (resp. $S$ is the third component of the spin operator). The expected current is computed in a non-equilibrium almost-stationary state, defined via space-adiabatic perturbation theory. When $S$ is a conserved quantity, i.e. $[H_0, S] = 0$, we recover a generalized Kubo formula for the conductivity, and consequently its quantization in appropriate units. When instead $[H_0, S] \neq 0$, we show that further correction terms appear in the Kubo-like formula for $\sigma_{ij}$. 