**RSPT Scattering in Q1D**

Once again we can say the following. In the 1D case, all longitudinal unperturbed states were free.



**Relating T-matrix to t, r, t´, r´**

The GF can be calculated in position space as before, with the iε prescription. The sum runs over all transverse states (channels). This will include non-propagating channels, called ‘closed’, where k**n** is imaginary (formula takes the positive imaginary root). Also the k-subscript is vector ‘cause two components.



Also, E is on-shell, at the Fermi level or whatever. Then we want to extract the transmitted and reflected part. Notice that we restricted the sum in the G0 to open channels, because in the asymptotic large |z| region, the closed channel contribution to G0 would be zero. But we might need to include closed channels in G itself.



And so we have for the transmission/reflection matrices, and associated coefficients.



φm,k is the coefficient of am factor, and so is the wavefunction normalized to unit current density along the z direction,



and,



Like we did with the 1D case, we can relate this to the scattering matrix:



**Relating T-matrix to S-matrix**

So the scattering matrix would be:



If we generalize the indices m, n, to allow for ±km,n, then we may rearrange the matrix to write:



In this form, it is basically the time-development S-matrix, sans some multiplicative factors.

**Relating full GF to t-matrix**

As before we’d like to relate the full G to the transmission coefficient. The first step is to change to the transverse basis:



Let n = 1, say, and call Gn1 to be Gn: Then we have:



And expanding back out of transverse basis, we see that:



So we see this satisfies Schrodinger equation, and I’ll have to work out rest later. A main result is that the asymptotic limit of the full GF is given by:



where of course



is the unit current density (along z direction) wavefunction.