Lorentz Integral Transform Method

(V. Efros, W. L., G. Orlandini)
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- Given a function $F(\omega)$ which contains information about a specific cross section for a reaction into the continuum
- Problem : Calculation of final state wave function
- Avoid calculation of final state wave function applying the LIT method

(a) calculate LIT : $L(\sigma = \sigma_R + i\sigma_I) = \int d\omega \frac{F(\omega)}{(\omega - \sigma_R)^2 + \sigma_I^2}$

(b) obtain $F(\omega)$ in a second step from the inversion of the transform:

Expand $F(\omega)$: $F(\omega) = \sum_{n=1}^{N} c_n \phi_n(\omega)$

$$\Rightarrow L(\sigma) = \sum_{n=1}^{N} c_n \int d\omega \frac{\phi_n(\omega)}{(\omega - \sigma_R)^2 + \sigma_I^2}$$

Determine c_n from a fit to the calculated $L(\sigma)$

Example : Inelusive Cross Section

Given in terms of response function $R(\omega) = \int df |\langle f|\hat{O}|i\rangle|^2 \delta(\text{energy})$

$L(\sigma) = \langle \tilde{\psi}_1(\sigma) | \tilde{\psi}_1(\sigma) \rangle$, $(H - E_0 - \sigma^*)\, \tilde{\psi}_1(\sigma) = \hat{O}\, \psi_i$