Average cross section

We now rewrite the S-matrix in a different way

\[ H = \Pi \Gamma = U \left( E_i - i \Gamma \right) U^{-1} \]

Similarity transformation

\[ S = S_{ab} - 2 \pi i \hbar a \left( \sum \frac{1}{E - E_i + i \Gamma} \right) U_i u_i U_{ab} \]

\[ \sum \gamma \Gamma_{\gamma \nu} = \sum \omega \omega c \omega c \]

we look at energies where a large number of channels contribute. Then

\[ \Gamma_\mu \rightarrow \Gamma_{\mu} \hat{u} \] use constant \( \Gamma_i \) as an approximation. Then \( U \) is close to unitary

The interpretation is that compound nuclear states within a region \( \Pi \) are excited simultaneously.

The reaction cross section is given by

\[ \sigma_\gamma (E) = \left| S_{ab} - 1 \right|^2 = (2\pi)^4 \left| \sum_{i} S_{ai} \left( \frac{1}{E - E_i + i \Gamma} \right) S_{ib} \right|^2 \]

have random strongly overlapping resonance phases

\[ \Delta E_i \ll \Gamma \]