Charge-exchange scattering amplitude in the Glauber approximation: the problem of the proportionality of the cross section with the matrix elements

$$f_{Aa\to Bb}(\Delta) = ik \sum_{LM} \int b\,db\,\mu_{LM}^{Aa\to Bb}(b) J_M(\Delta b)$$

$$\times e^{\lambda(b)+\chi(b)} e^{-iM\varphi_\Delta}.$$

$$\mu_{LM}^{Aa\to Bb}(b) = \frac{1}{ik_{NN}} \langle t_a n_a t_b - n_b | 1 n_a - n_b \rangle \langle t_A n_A t_B - n_B | 1 n_A - n_B \rangle$$

$$\times \sum_{J_p J_t} \hat{J}_p \hat{J}_t \langle j_a m_a j_b - m_b | J_p m_a - m_b \rangle \langle j_A m_A j_B - m_B | J_t m_A - m_B \rangle$$

$$\times \sum_{KS} \hat{K} \sum_{l_p l_t L_{pt}} \hat{L}_{pt} \begin{Bmatrix} l_p & l_t & L_{pt} \\ S & S & K \\ J_p & J_t & L \end{Bmatrix} [[B_{l_p} B_{l_t}]^{L_{pt}} B_K]^L_M \int q\,dq\,\hat{\rho}_{ab}^{l_p,S,J_p}(q) \hat{\rho}_{AB}^{l_t,S,J_t}(q) f_{NN}^{1SK}(q),$$

charge-exchange transition density in the projectile

charge-exchange transition density in the target

Example: population of ^{208}Tl via (^{13}C,^{13}N) reaction

Approach:

structure: RPA calculation (strength and transition density for L=0,1,2,3)

dynamics: Glauber model for charge-exchange processes

Obs: (^{13}C,^{13}N) transition favors non-spin flip Fermi over Gamow-Teller in ^{208}Tl

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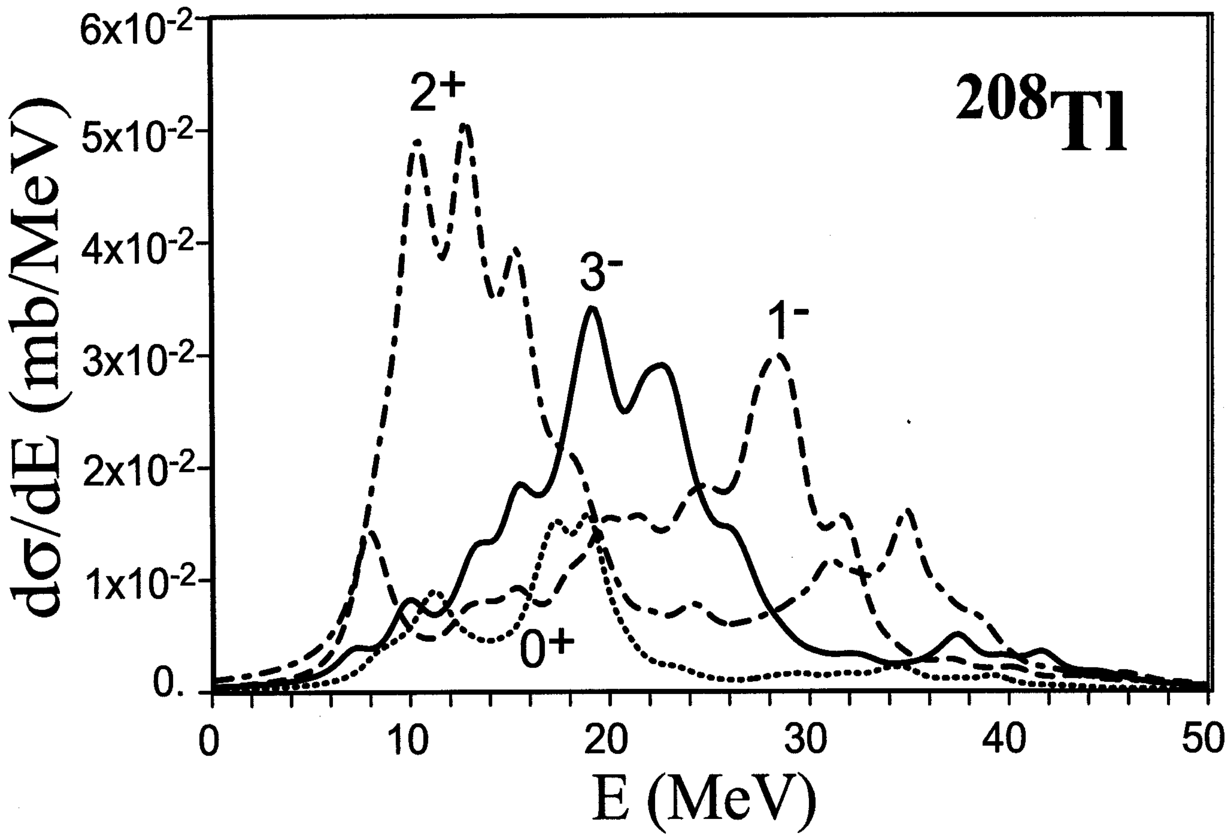
$^{208}Pb(^{13}C,^{13}N)^{208}Tl$ E/A=60 MeV

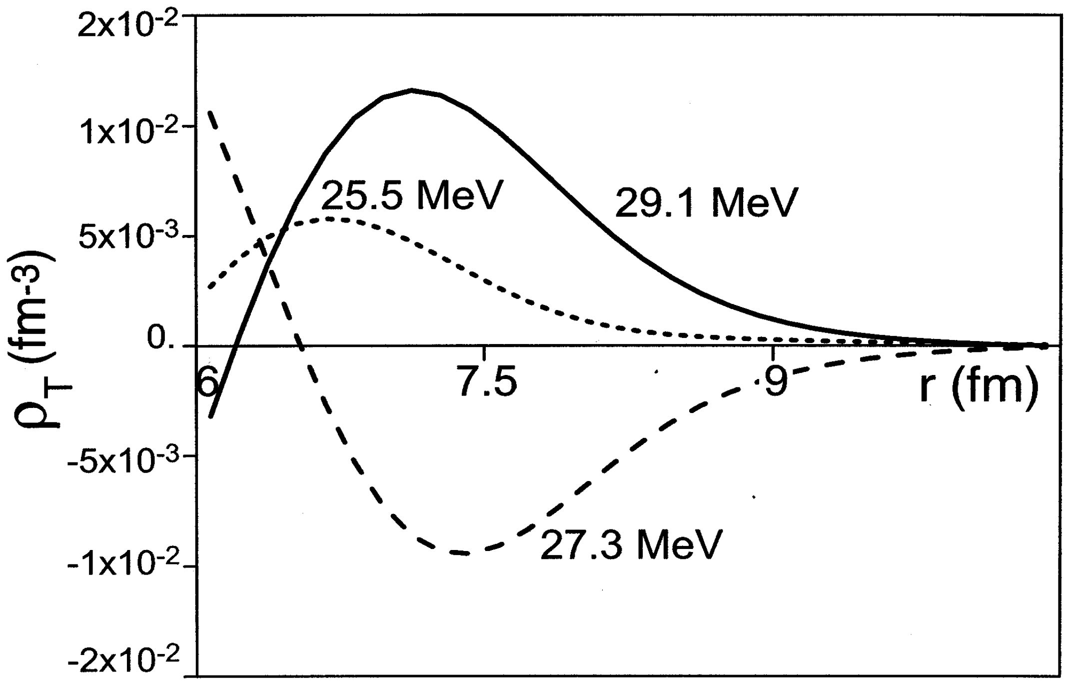
Calculated excitation function: contribution of different multipolarities



Transition densities: radial behaviour

Dipole charge-exchange response in ^{208}Tl

Transition densities for three selected dipole states



Charge-exchange cross section vs strength

$^{208}Pb(^{13}C,^{13}N)^{208}Tl$ E/A=60 MeV