

# Studies of the $^{12}\text{C}$ nucleus using $\beta$ -decay of $^{12}\text{N}$ and $^{12}\text{B}$

ISOLDE Workshop and Users meeting

December 19, 2007

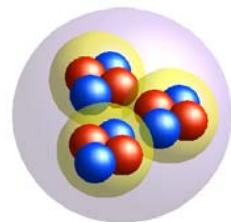
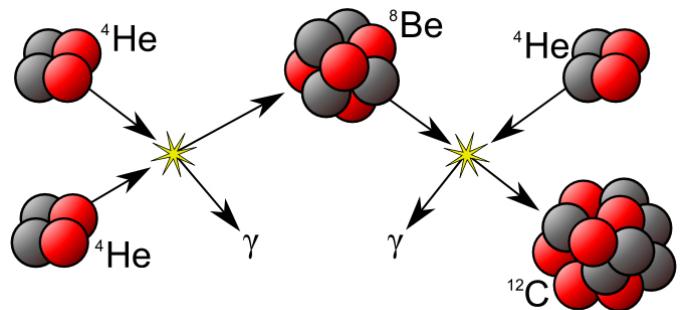


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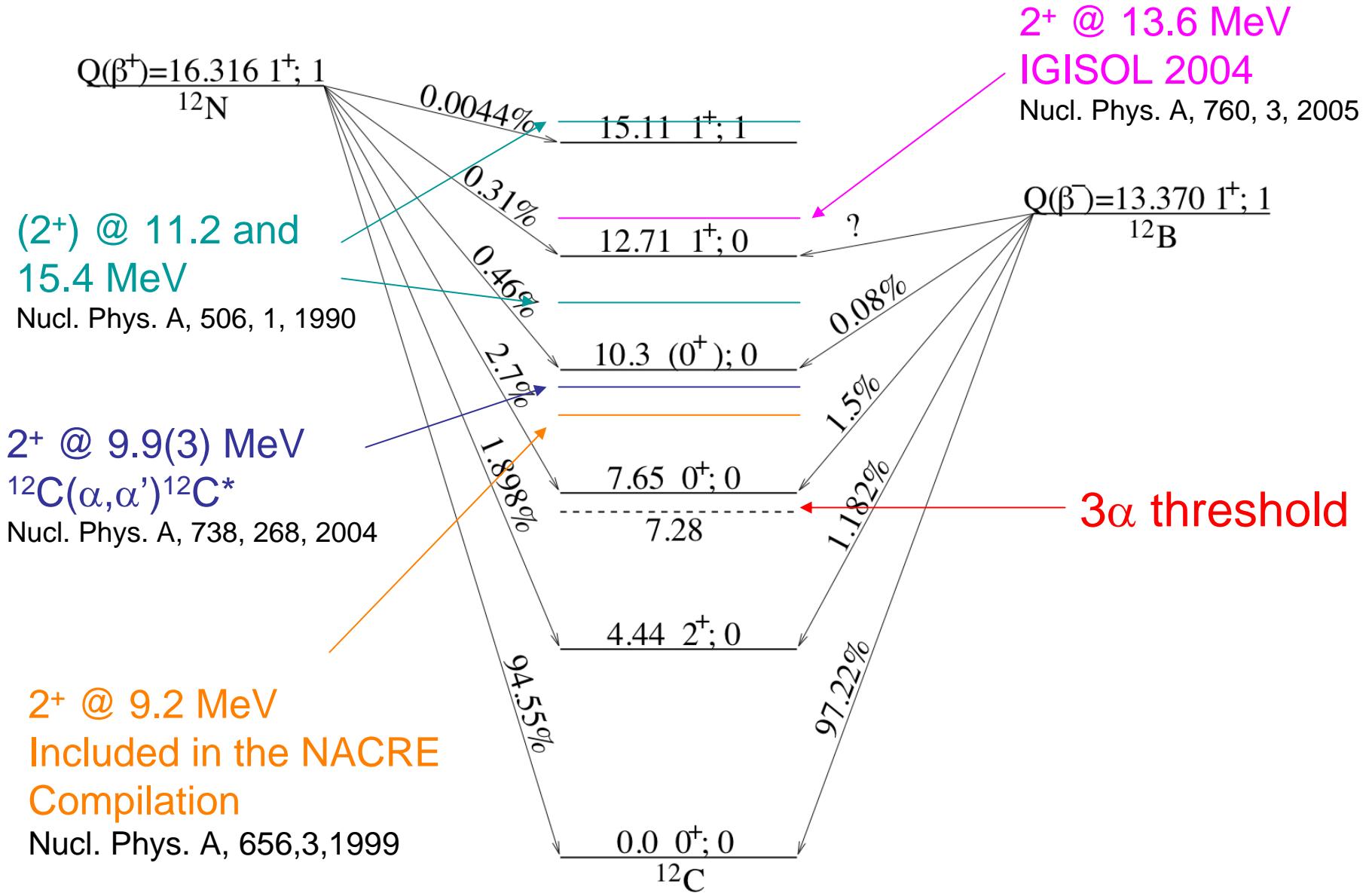


# Why study $^{12}\text{C}$ ?

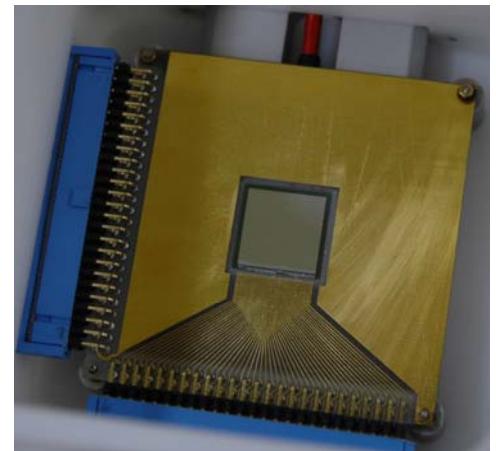
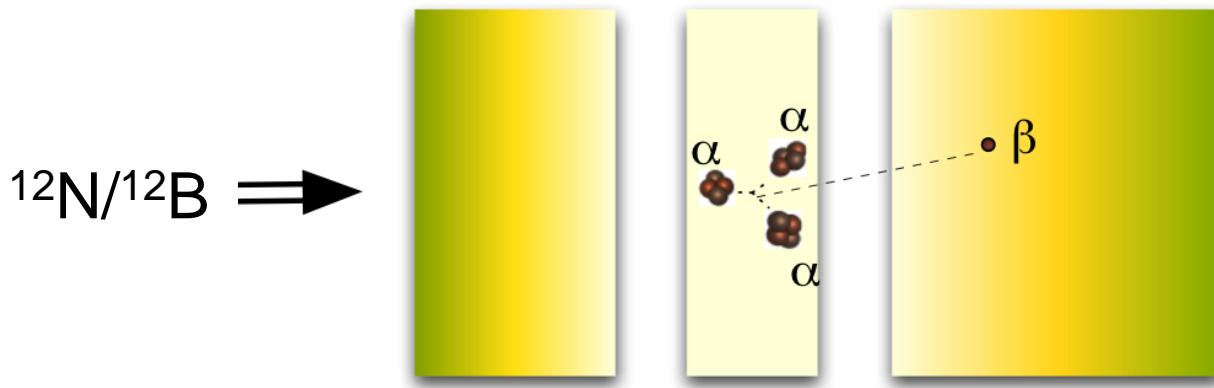
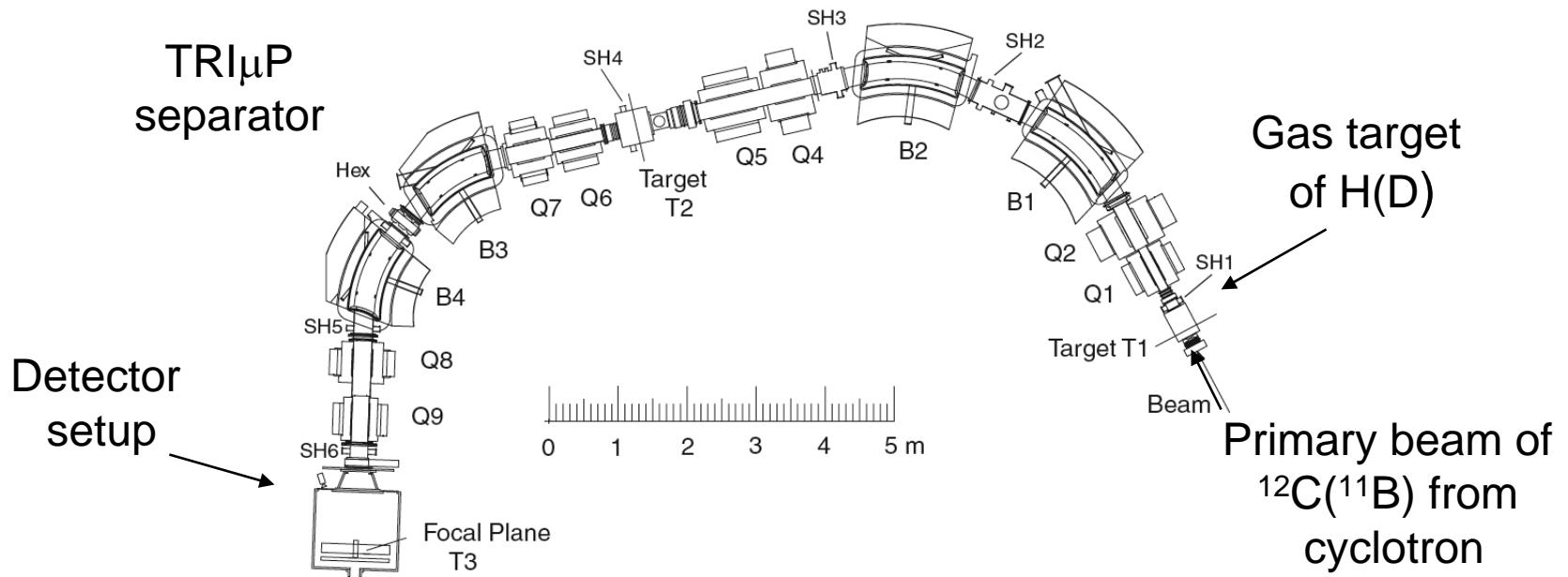
- The triple alpha process
  - Reaction rate
- Nuclear structure
  - Shell model
  - $3\alpha$  cluster model
  - Antisymmetrized Molecular Dynamics
  - No-core shell model
  - Green's function Monte Carlo

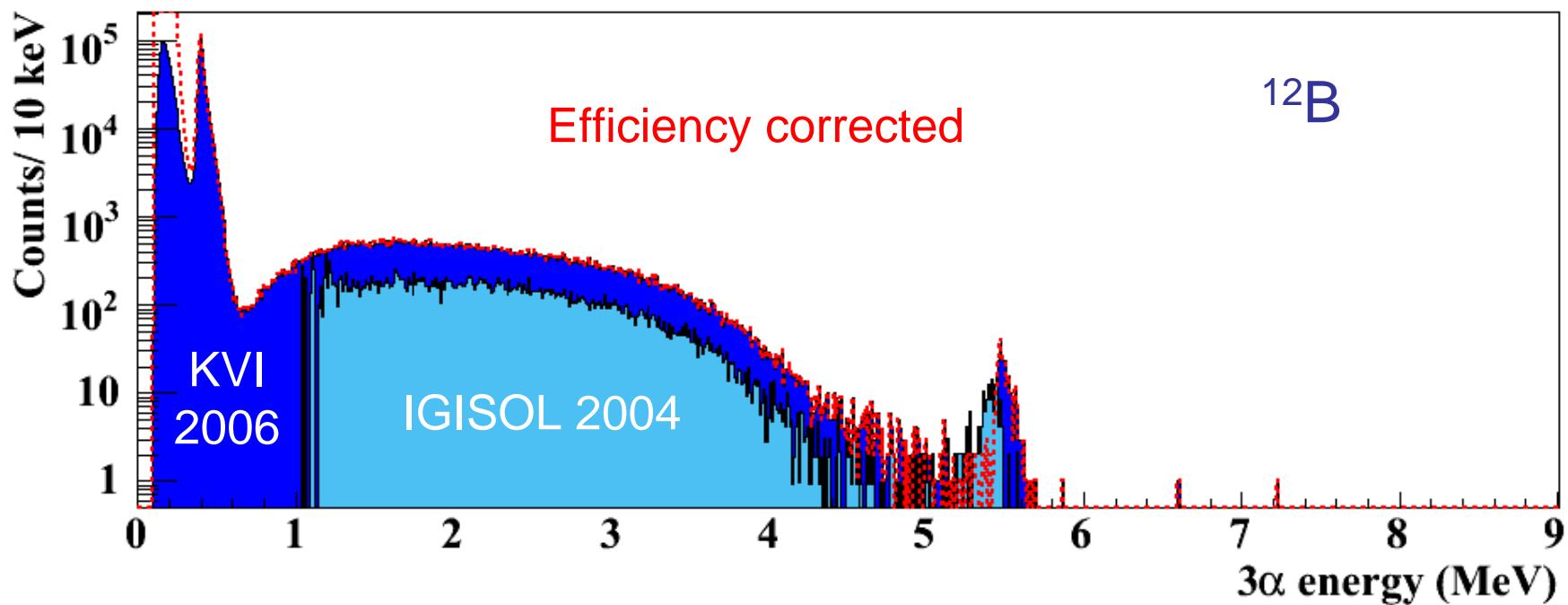
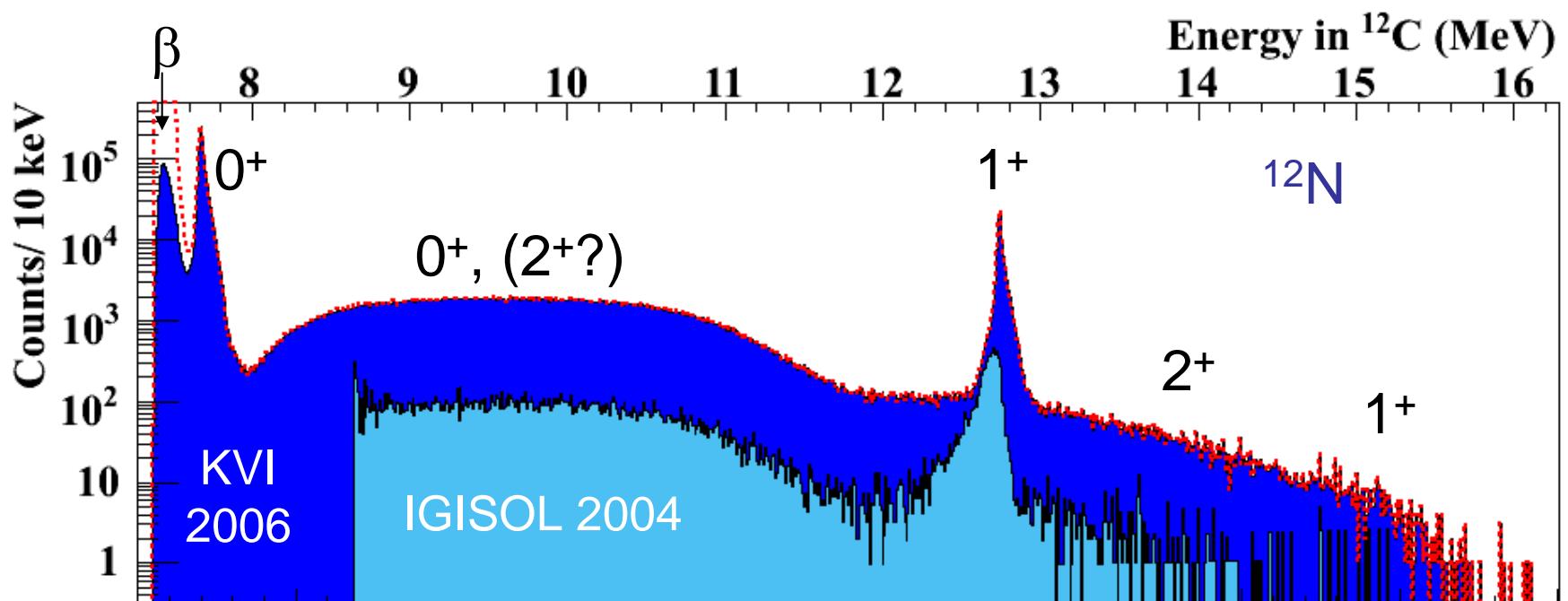


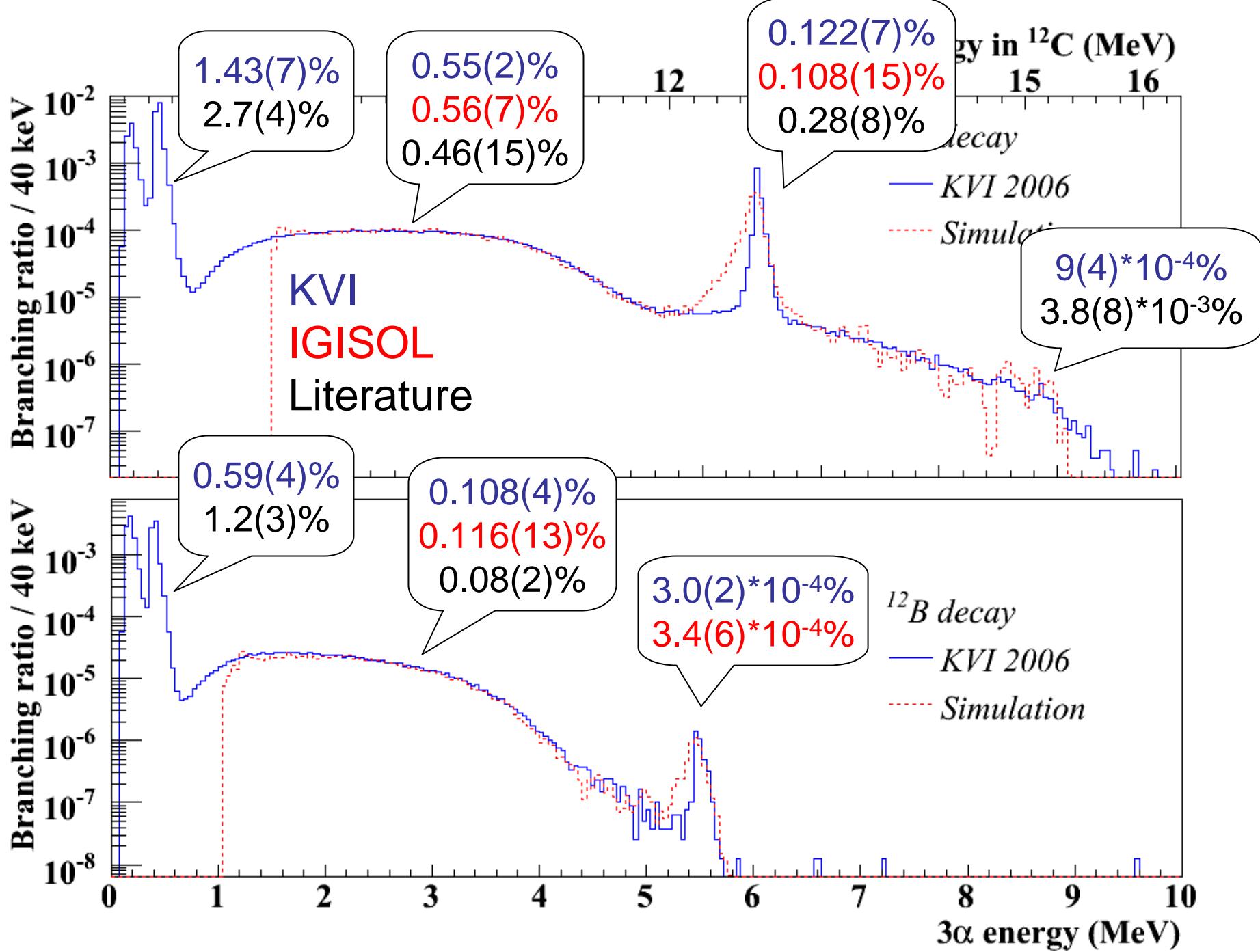
# Energy levels in $^{12}\text{C}$ populated in $\beta$ -decay



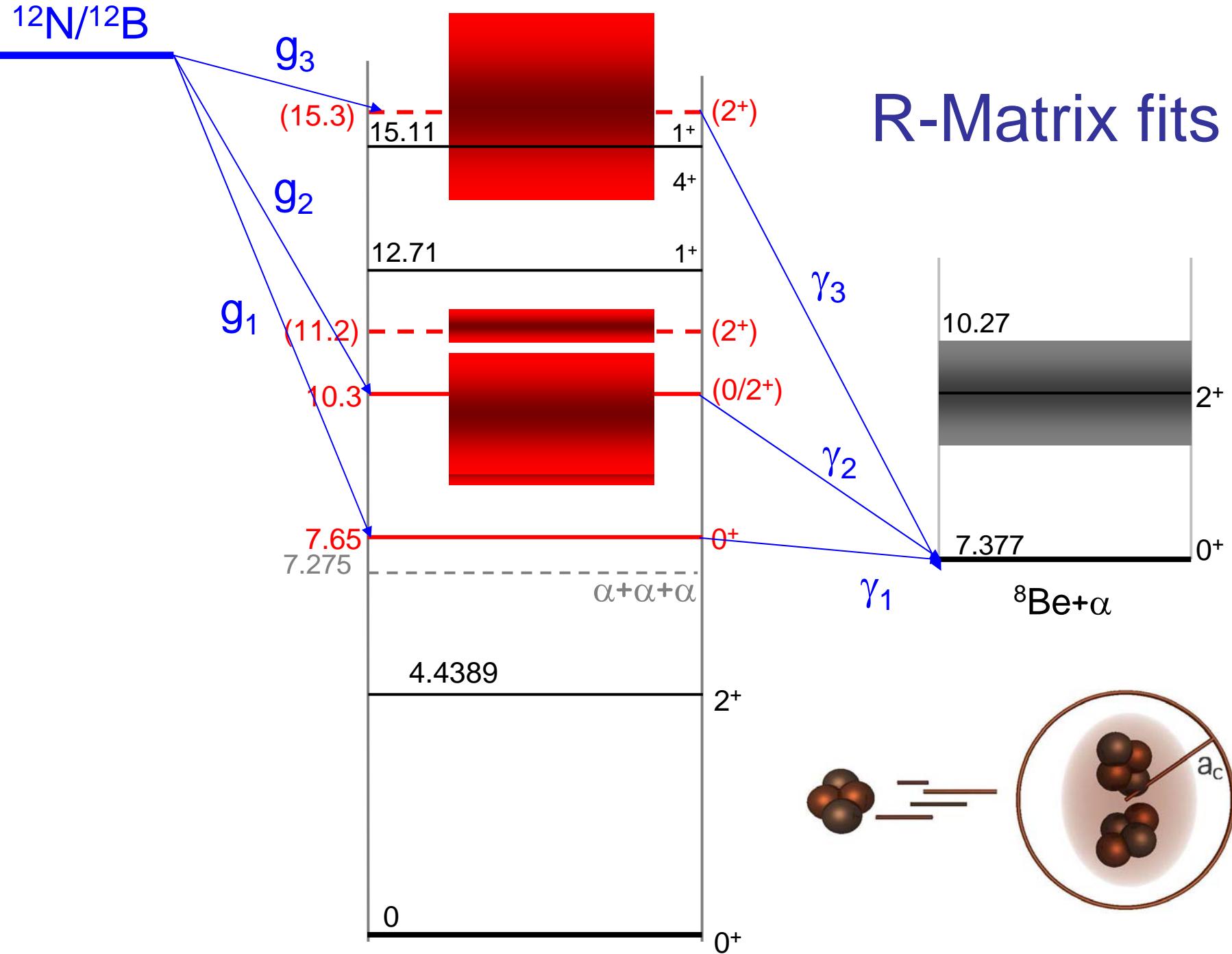
# Experimental setup

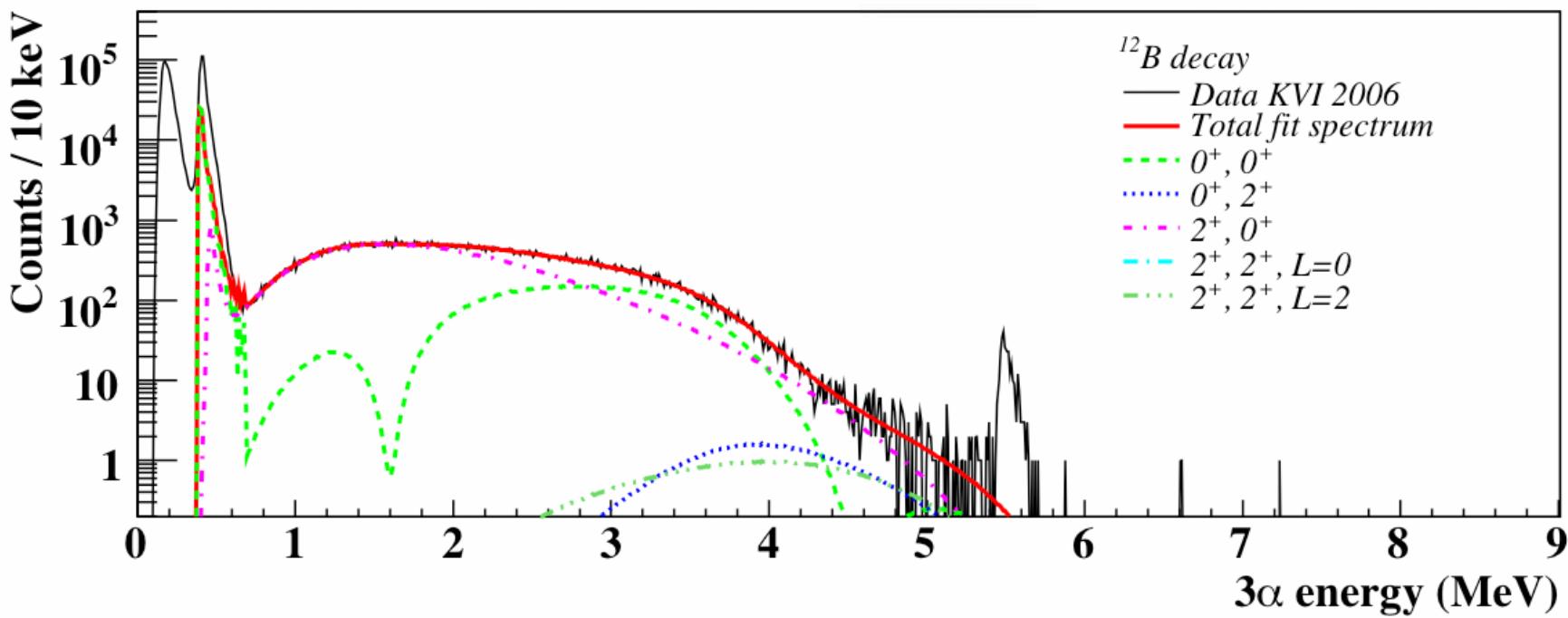
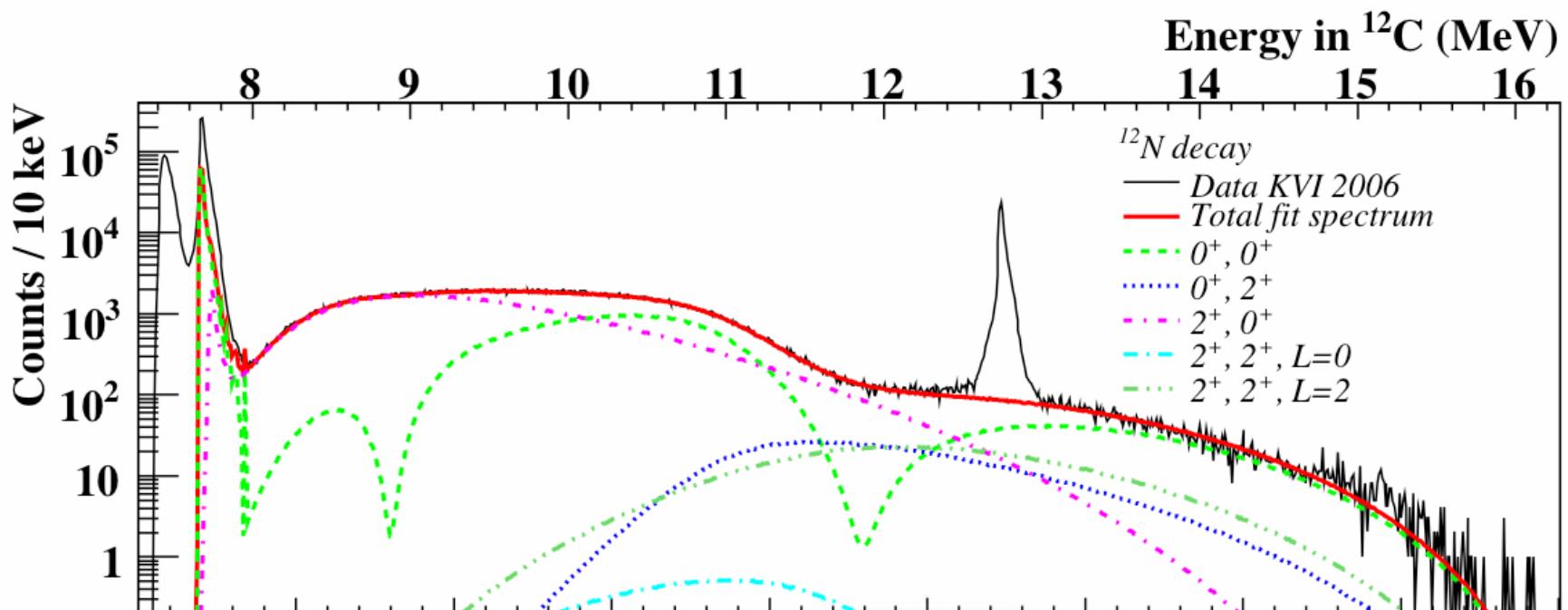






# R-Matrix fits





# Thank you for your attention!

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# R-Matrix formalism

$$W(E) = \sum_{x=F,GT} \sum_{j_a} \sum_{j_b l} W_{j_b l x}^{j_a}(E)$$
$$W_{j_b l x}^{j_a}(E) = C^2 f_\beta P_l(E) \left| \sum_{\lambda \mu} g_{\lambda x} \gamma_{\lambda j_b l}^{j_a} A_{\lambda \mu}^{j_a}(E) \right|^2$$
$$[A^{j_a}(E)^{-1}]_{\lambda \mu} = (E_\lambda^{j_a} - E) \delta_{\lambda \mu} - \sum_{j_b l} \gamma_{\lambda j_b l}^{j_a} \gamma_{\mu j_b l}^{j_a} (S_l(E) + i P_l(E))$$
$$+ \sum_{j_b l} \begin{cases} (\gamma_{\lambda j_b l}^{j_a})^2 S_l(E_\lambda) & \lambda = \mu \\ \gamma_{\lambda j_b l}^{j_a} \gamma_{\mu j_b l}^{j_a} \frac{S_l(E_\lambda)(E - E_\mu) - S_l(E_\mu)(E - E_\lambda)}{E_\lambda - E_\mu} & \lambda \neq \mu \end{cases}$$

$$S_l(E) = \int_0^\infty S_l(E - E') \rho_{j_b}(E') dE'$$

$$P_l(E) = \int_0^\infty P_l(E - E') \rho_{j_b}(E') dE'$$