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Description

The directions of the neutrino (ν) and the electron/positron (β) are chosen randomly (independent isotropic distributions) relative to the direction of the delayed particle in the recoil frame. The kinetic energy of the electron/positron, T_β, is chosen randomly (uniform distribution) from 0 to the maximum possible value, $T_{\beta,\mathrm{max}} = Q - E_x$, where Q is the Q-value and E_x is the excitation energy in the daughter nucleus, both specified in the input file. The neutrino energy is calculated as $E_\nu = T_{\beta,\mathrm{max}} - T_\beta$. The recoil momentum of the daugther nucleus is determined by the requirement of momentum conservation: $\boldsymbol{p}_\mathrm{R} = -(\boldsymbol{p}_\beta + \boldsymbol{p}_\nu)$. The recoil energy is calculated as $E_\mathrm{R} = p_\mathrm{R}^2/2Am$ where A is the mass number provided in the input file and m denotes the atomic mass unit (931.494 MeV). The energy of the delayed particle in the recoil frame is calculated as $E_p = \frac{A-a}{A}(E_x - E_\mathrm{thres})$ where $a = 1$ for neutrons and protons and $a = 4$ for α particles and E_thres is the particle-decay threshold specified in the input file. The laboratory velocity of the delayed particle, $\boldsymbol{u}$, is obtained from the velocitiy in the recoil frame, $\boldsymbol{v}$, by simple vector addition: $\boldsymbol{u} = \boldsymbol{v} + \boldsymbol{V}_\mathrm{R}$ with $\boldsymbol{V}_\mathrm{R} = \boldsymbol{p}_\mathrm{R}/Am$. The phase-space factor is calculated as $f(T_\beta) = (Q - T_\beta)^2 p_\beta (T_\beta + m_e c^2)$ where $p_\beta = (T_\beta^2 + 2m_e c^2 T_\beta)$ is the momentum of the electron/positron. The kinetic energy of the electron/positron is sampled from $f(T_\beta)$. The weight of the event is given by the triple correlation amplitude, w, which is calculated from eq. (5) of ref. [1].

References

[1] E. T. H. Clifford *et al.*, Nucl. Phys. A **493**, 293 (1989).