

Proposed experiment to measure γ -rays in high resolution hadron beam experiments $O(p, p')X$ and $O(^3He, t)X$ and the detection of γ -rays in $\nu - ^{16}O$ reactions

The γ -rays produced from excited nuclei in neutral-current (NC) neutrino-oxygen (even charged-current (CC) $\nu - O$) interactions have not been measured at $E_\nu = 10 - 100$ MeV. They are very important, since they will add extra signals or become unexpected background in Supernova neutrino detection. Neutrinos at $E_\nu = 20 - 100$ MeV are expected to excite 1^- , 1^+ and 2^- (giant resonances) in NC reactions $O(\nu, \nu')O^*$, which decay to $^{15}N^* + p$ and $^{15}O^* + n$; the γ -rays are produced from $^{15}N^*$ and $^{15}O^*$. But, no previous experiments have checked such expectations. We show a proposed experiment to measure the γ -ray spectrum produced in the hadron beam experiments $O(p, p')X$ ($\Delta T=0,1$) and $O(^3He, t)X$ ($\Delta T=1$) at RCNP(Osaka). They will give the information on the Fermi and Gamov-Teller transition strength from the ground state to the excited states of the oxygen, associated with the γ -ray production. Such experiment will further develop an initial measurement of the γ -ray spectrum in $O(p, 2p)N$ reaction at RCNP (K.Kobayashi et al., nucl-ex/0604006).

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