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Light-neutrino exchange and long-distance contributions to neutrinoless double beta decay

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Recently four experiments have demonstrated new levels of sensitivity to neutrinoless double beta ($0\nu\beta\beta$) decay. Such decay, if exists, would prove that neutrinos are Majorana fermions. The light-neutrino exchange is the most popular mechanism to explain the $0\nu\beta\beta$ decay. In this mechanism, the decay amplitude is proportional to the effective neutrino mass $m_{\beta\beta}$ and thus the detection of $0\nu\beta\beta$ decay would provide the information about the absolute neutrino mass. We report the lattice QCD calculation of the $0\nu\beta\beta$ decay amplitude, which involves light-neutrino exchange and significant long-distance contributions.

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