

# Long-distance contribution to neutrinoless double beta decays in pion sector

Wednesday, 5 August 2020 14:20 (20 minutes)

Neutrinoless double beta decay, if detected, would prove that neutrinos are Majorana fermions and provide the direct evidence for lepton number violation. If such decay would exist in nature, then  $\pi^-\pi^- \rightarrow ee$  and  $\pi^- \rightarrow \pi^+ee$  (or equivalently  $\pi^-e^+ \rightarrow \pi^+e^-$ ) are the two simplest processes accessible via first-principle lattice QCD calculations. In this work, we calculate the long-distance contributions to the  $\pi^- \rightarrow \pi^+ee$  transition amplitude using four ensembles at the physical pion mass with various volumes and lattice spacings. We adopt the infinite-volume reconstruction method to control the finite-volume effects arising from the (almost) massless neutrino. Providing the lattice QCD inputs for chiral perturbation theory, we obtain the low energy constant  $g\pi\pi\nu(m\pi) = -10.89(28)\text{stat}(74)\text{sys}$ , which is close to  $g\pi\pi\nu(m\pi) = -11.96(31)\text{stat}$  determined from the crossed channel  $\pi^-\pi^- \rightarrow ee$  decay.

**Primary author:** TUO (\*), Xin-yu (Peking university)

**Co-authors:** FENG, Xu; JIN, Lu-chang

**Presenter:** TUO (\*), Xin-yu (Peking university)

**Session Classification:** Weak Decays and Matrix Elements

**Track Classification:** Weak Decays and Matrix Elements