



Contribution ID: 195

Type: **Parallel Talk**

Neutrinoless Double Beta Decay from Lattice QCD: The $n^0 n^0 \rightarrow p^+ p^+ e^- e^-$ Amplitude

Monday, 31 July 2023 15:10 (20 minutes)

Neutrinoless double beta decay is a hypothetical beyond the Standard Model (BSM) process that, if observed, would imply that neutrinos are Majorana particles. Interpreting the results of double beta decay experiments requires knowledge of nuclear matrix elements that are calculable with lattice QCD. This talk presents determinations of the long-distance (mediated by a light Majorana neutrino) and short-distance (mediated by heavy BSM physics) contributions to the $n^0 n^0 \rightarrow p^+ p^+ e^- e^-$ decay through lattice QCD calculations, performed on a single ensemble at heavier-than-physical quark mass where the dineutron is assumed to be bound. These results provide proof-of-concept and can be used to compute low-energy constants in effective field theory, and we present a determination of these quantities.

Topical area

Particle Physics Beyond the Standard Model

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Session Classification: Tests of Fundamental Symmetries