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Probing New Physics with Double Beta Decay

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Neutrinoless double beta decay is the primary means with which we can probe a potential Majorana nature of light neutrinos. Planned experiments searching for this hypothetical decay aim to be sensitive to half-lives of up to 10ˆ28 years, allowing to probe Majorana neutrino mass scales of O(10 meV). It is also well established that neutrinoless double beta decay receives contributions beyond light neutrino exchange in New Physics scenarios beyond the Standard Model (SM) that incorporate lepton number violation, such as sterile Majorana neutrinos and R-Parity violating supersymmetry. After briefly reviewing neutrinoless double beta decay and its interpretations, I will motivate the use of two-neutrino double beta decay to probe for exotic physics as well. This decay, allowed in the SM and observed in several isotopes, is typically considered background to neutrinoless double beta decay searches. Besides allowing insights into nuclear matrix elements it can also be used to search for New Physics, though, due to high event statistics in current and future double beta decay searches. In this context, I will discuss modifications of the double beta decay spectrum due to exotic particle emission (such as kinks from sterile neutrinos), exotic currents beyond V-A and neutrino self-interactions, motivating the search for such scenarios.

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