



Contribution ID: 1

Type: **Plenary Talk**

Exploring Double Beta Plus Decays with NuDoubt++

Tuesday, September 30, 2025 1:40 PM (30 minutes)

Double beta plus decay is a rare nuclear disintegration process. Difficulties in its measurement arise from suppressed decay probabilities, experimentally challenging decay signatures and low natural abundances of suitable candidate nuclei. Studying these decays can offer valuable insights into nuclear structure and fundamental symmetries. The decay rate is influenced by nuclear matrix elements (NMEs) and phase space factors (PSFs) - both essential for interpreting results and refining theoretical models.

In this context, we present NuDoubt++, a new detector concept to overcome the experimental challenges. It is based on the first-time combination of hybrid and opaque scintillation detector technology paired with novel light read-out techniques. This approach is particularly suitable detecting positron (beta plus) signatures. We expect to measure two-neutrino double beta plus decay modes in less than two years of operation. Moreover, we are able to probe neutrinoless double beta plus decays at several orders of magnitude improved significance compared to current experimental limits.

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