Xenon-Doped DUNE for 0νββ

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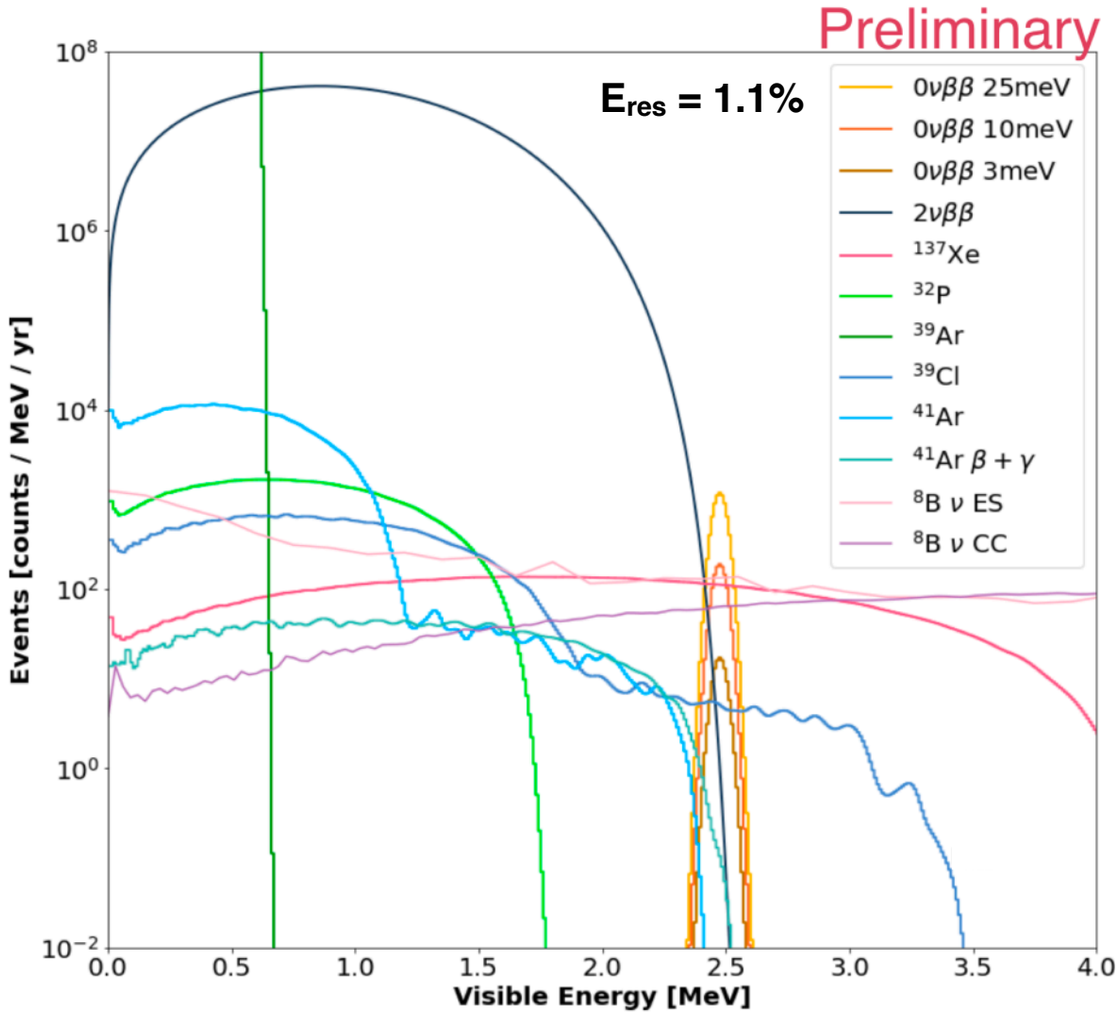
- **Concept:** Use a monolithic DUNE FD module with the LAr doped to 2% with xenon-136
- **Strength:** With the large size of DUNE we can heavily fiducialize the inner volume, rejecting most surface radiological backgrounds
- **Possible Reach:** At 2% doping and within a 2m buffer we would have >300 tons of xenon-136 placing the normal hierarchy region within reach



Initial background studies, sampled within a 3m fiducial volume along with cuts to mitigate decays with coincident photons and alphas

Caveat: Studies of neutron induced backgrounds ongoing

Challenges

While this concept places a 100-ton scale mass of ^{136}Xe inside a sensitive detector there are many R&D challenges that need to be tackled:

Xenon Doping

- Doping LAr to 2% has never been tested on the scale of DUNE
- The quantities of xenon needed require non-commercial solutions **[See LOI by B. Mong (SLAC)]**
- Enriching this much xenon would also be a challenge
- A staged approach could be used

Energy Resolution

- The sensitivity of the detector depends strongly on E_{res}
- Achieve %-level E_{res} requires measuring the energy in both ionization and scintillation
- To do this in a DUNE-sized detector one could convert light into charge using photo-ionizing dopants

Background Mitigation

- Initial studies have been promising but extending them to include a realistic detector readout is required to understand the true reach of such an experiment
- More sophisticated background rejection techniques could be explored