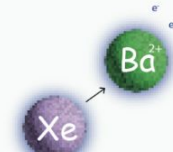


Workshop on Xenon Detector $0\nu\beta\beta$

Searches: Steps Towards the Kilotonne Scale

October 25 -27 2023

SLAC National Accelerator Laboratory

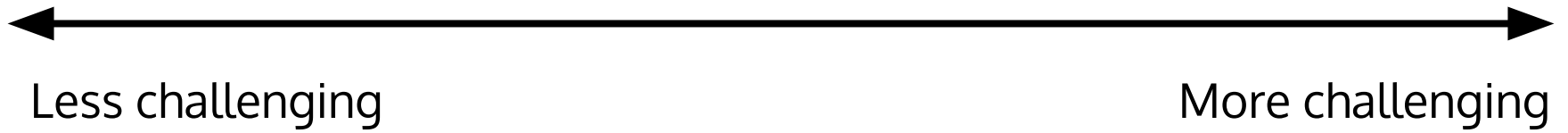


Concluding remarks

Brian

First off, thank you.

Relative difficulty



Relative difficulty

Acquiring a
kilotonne of
xenon



Less challenging

More challenging

Relative difficulty

Successfully implementing
Ba-tagging

- B. Jones, slide 20

Acquiring a
kilotonne of
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Acquiring a
kilotonne of
xenon

Getting different gov't
agencies to coordinate

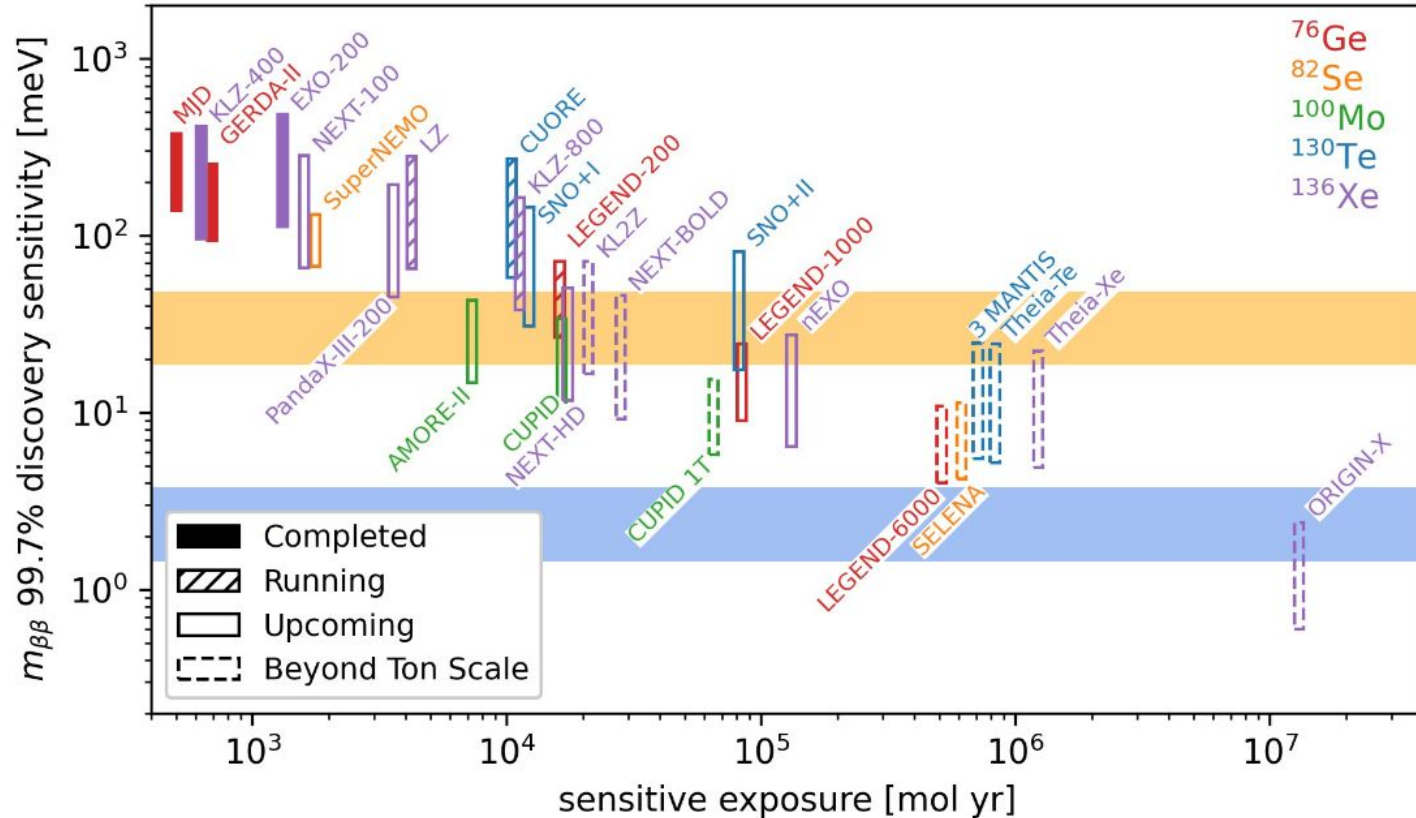
- S. Sangiorgio, slide 16



Less challenging

More challenging

...but clearly it's worth the effort



Outline of white paper

1. **Physics case for pushing towards kton-scale Xe detectors: neutrinoless double beta decay towards 1 meV sensitivity**
 - i. Other physics is possible with such a detector, but is not the primary driver at this scale: solar neutrinos, dark matter, supernova detection (multiple channels?), other lepton number violation searches
 - ii. However, coordination with ongoing programs, particularly dark matter, will be key to enabling continued forward progress. Also, these other science drivers are exciting and should continue to be pursued!
2. **Discussion of xenon acquisition status and challenges**
 - i. Major drivers of xenon availability (thank you, Amandine, for being here!)
 - ii. Projected needs for the scientific program in fundamental physics
 - iii. The need for R&D on new acquisition strategies
 - iv. Possibilities for coordination between programs
 1. DUNE / Liquid Scintillator concepts as "storage" while we acquire kton levels?
 2. Enriched XLZD as an upgrade and stepping stone to the kton scale?
 3. ??
3. **Detector R&D program towards the kton scale**
 - i. Ba tagging
 - ii. Detector concepts (large caverns, gas vs. liquid, dopants, etc.)
 - iii. Future readout technologies schemes

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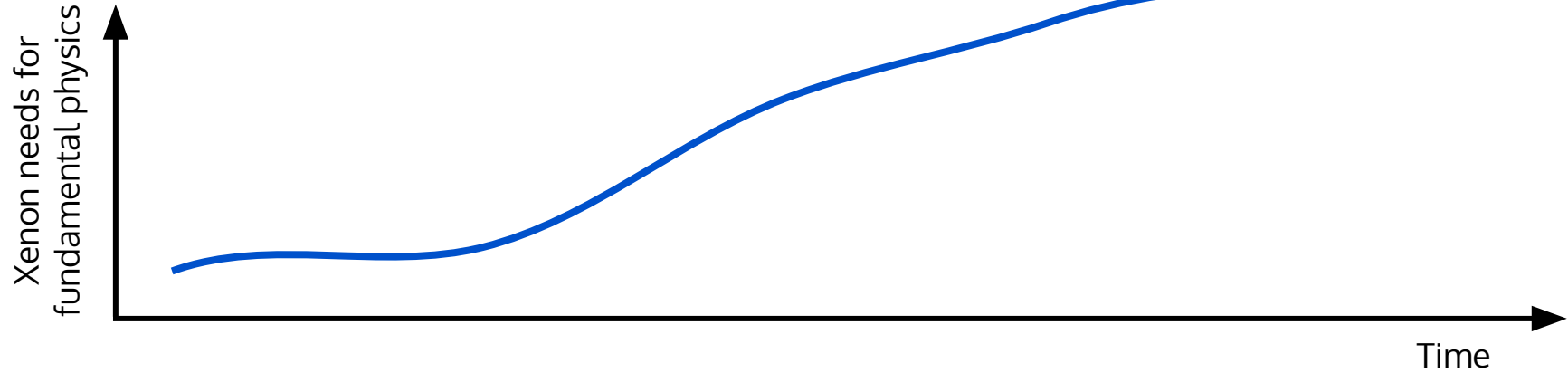
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3. Detector R&D program towards the kton scale

- i. Ba tagging
- ii. Detector concepts (large caverns, gas vs. liquid, dopants, etc.)
- iii. Future readout technologies schemes
- iv. Make the point that, even with ktons of xenon, sensitivity still requires additional background suppression, motivating new technology development

Cartoon of "xenon usage" graph



Tonne-scale DBD



G3 dark matter



Beyond-the-tonne-scale DBD



ORIGIN-X

