The Mitchell Institute Neutrino Experiment at Reactor (MINER) Detector Payload

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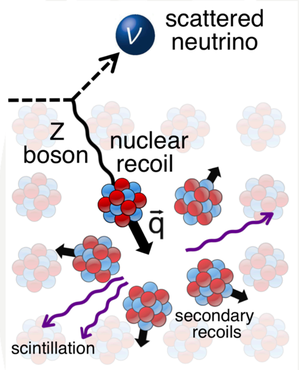
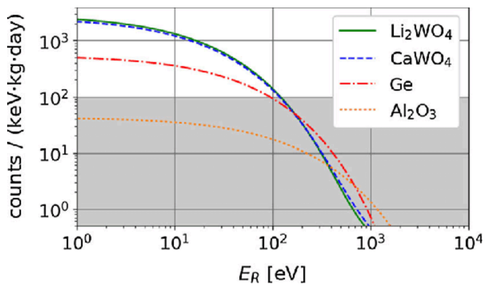
Introduction and Motivation

- Coherent Elastic Neutrino-Nucleus Scattering (CEνNS)
  - Neutrino recoils coherently with nucleus, under exchange of a Z, up to $\sim 50MeV$
  - Neutral current interactions $\rightarrow \sigma \propto A^2$
- Proven CDMS style **athermal** phonon detectors:
  - Photolithographically deposited Transition Edge Sensors (TES)

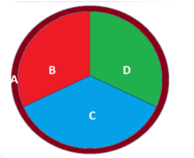




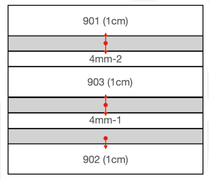
Mission Relevance

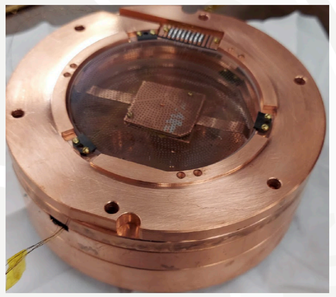
- Incredibly high penetration properties of neutrinos allow unique reactor power monitoring capabilities
- Non-proliferation of weapons-grade materials

Technical Approach



- Detector Payload:
  - 3x 250g (1cm) Al_2O_3
  - 2x 100g (4mm) Al_2O_3
  - 4 channel
  - Internal ^{55}Fe sources

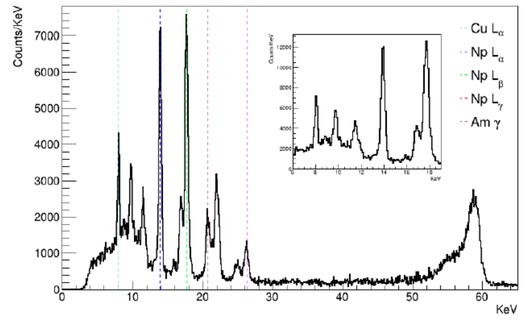




- Cooled to ~8mK in BlueFors LD400 pulsetube based dilution refrigerator
- Experiment located at Texas A&M's Nuclear Science Center
  - 1MW TRIGA reactor with moveable core

Expected Impact

- Detect CEVNS from a reactor for the **first time!**
- Probe Non-standard Interactions (NSI) of Standard Model
- Search for sterile neutrinos



MTV Impact

- As a first year MTV Fellow, allowing full focus on my research has been the biggest impact
- I am excited to work with national labs on background reduction and vetos

Conclusion

- With successful Al_2O_3 detector performance achieved in the TAMU testing facility, the MINER experiment has modified its payload to a full Al_2O_3 stack

Next Steps

- Actively working towards electron-nuclear recoil discrimination
- Utilize thermal phonons as a measure of total energy

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