External neutrons in the DUNE experiment

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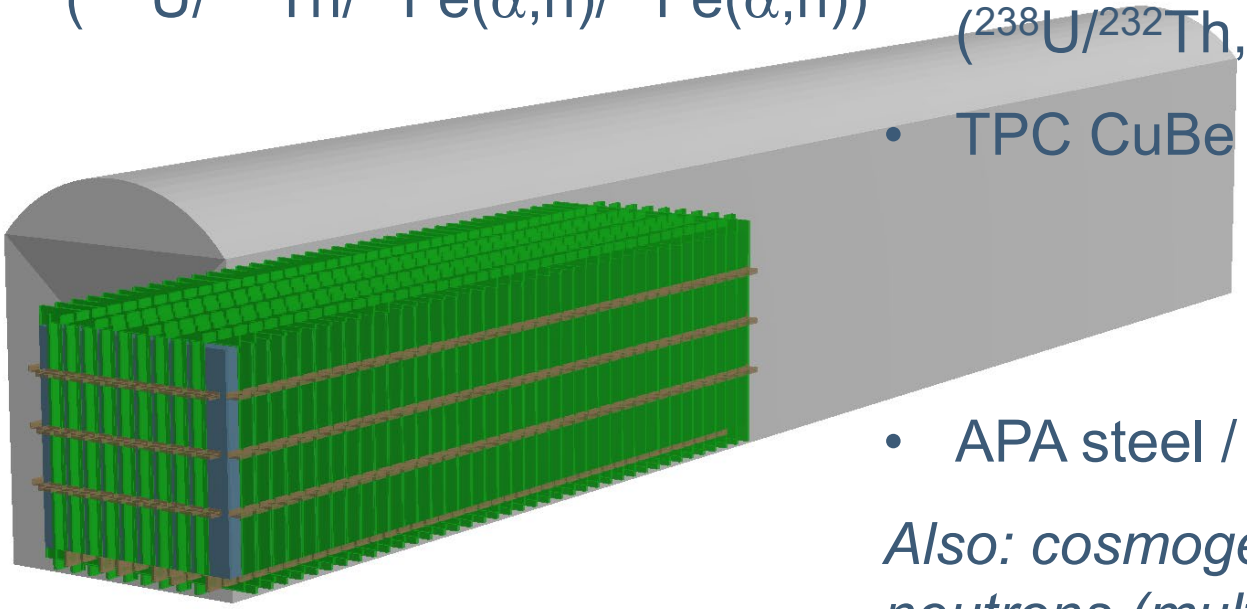
DUNE

Overview

Dominant (large mass):

- Rock (^{238}U/^{232}Th)
- Shotcrete (^{238}U/^{232}Th)
- Support structure (1.5 ktonne) (^{238}U/^{232}Th/^{56}Fe(α,n)/^{54}Fe(α,n))



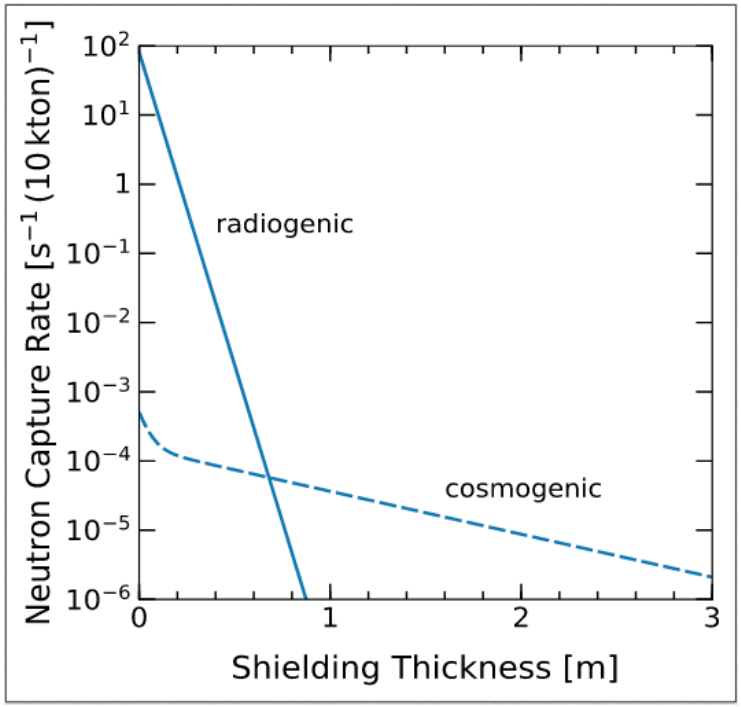
Subdominant (low mass/activity):

- ^{222}Rn in LAr: source of αs: ^{40}Ar(α,n)
- Insulation (glass fibre) (^{238}U/^{232}Th)
- Cryostat steel (^{238}U/^{232}Th,^{56}Fe(α,n)/^{54}Fe(α,n))
- TPC CuBe wires Be(α,n)
- APA steel / materials (^{238}U/^{232}Th)

Also: cosmogenically generated neutrons (multiple)

Neutron background mitigation

- Rock & shotcrete: considering shielding? (water or plastics)
- Steel support structure: quality control
- Internal material: background screening, minimise exposure to mine air, maximise air from surface
- Internal radioactivity (LAr): background screening and quality control of filter materials



Possible effect of screening:
Arxiv:1808.08232

Today's agenda

A lot of progress has been made on the simulation and verification

- Full simulation of DUNE
- Full understanding of the materials in DUNE
- Independent checks of the implementation
- Understanding the neutron flux
- Simulation results