Requirements from Low Background Experiments

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Low Background Experiments

- SuperCDMS, EDELWEISS-II
  - WIMP search with Ge
- EXO
  - Majorana neutrino search by neutrinoless double beta decay of ^{136}Xe
- Gran Sasso, ZEPLIN-III
  - WIMP search with liquid Xe

Important Physics

- Muon-induced showers and muon capture
- Background radioactivity (α, β , γ)
- Nuclear recoil from low energy neutrons and ions

- Low energy EM physics (Auger and fluorescence)
- Optical reflection

SuperCDMS, EDELWEISS-II Requirements

- Improved neutron production in muon-induced showers
- Validation of neutron production from muon capture on wide range of nuclei
- Validation of beta decay
- Better α-n reactions below 10 MeV

EXO Requirements

- Better beta decay spectra
  - Currently only allowed beta transitions in Geant4
  - Need 1^{st}, 2^{nd}, 3^{rd} unique forbidden transitions
- Updated radioactive decay database
  - Need to indicate forbidden transitions for several nuclei: ^{39}Ar, ^{40}K, ^{85}Kr, ^{210}Bi, and more

Gran Sasso, ZEPLIN-III Requirements

- Forbidden β decays
- Improved optical reflection models and precision reflection data
- Improved photo-evaporation model and data
- Population of meta-stable nuclear states by neutrons
  - Geant4 currently does only ground state
- Low energy (α, n) reactions
- Improved μ-nuclear reactions, capture