FLUKA work for AARM

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AARM meeting August 5 2014

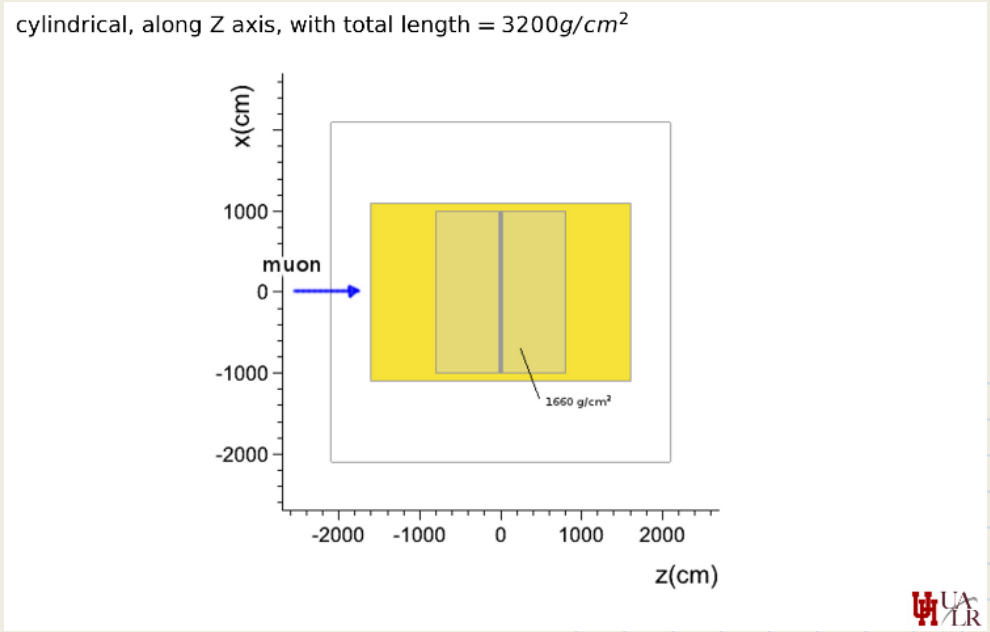
Status - Quick Update

- On the website we have the Fluka results up for all the targets at all the energies.
- The Fluka version has been stable throughout the study but we are expecting a new release for the end of the year -> updating website
- We have a write up on the mono-energetic muon beam approximation
  - intend to place this on the website in the arxiv

- Also preparing a write up describing what is available from the website with some comparison with Geant4 especially with the isotopes

Review of the Geometry

Very simple geometry of a cylinder in which the dimensions change according to the density of the target.



Interested Targets:
Liquid Scintillator
Water
Calcium Carbonate
Iron
Lead
Greenstone

Interested Energies:
30, 100, 280 and 1000 GeV

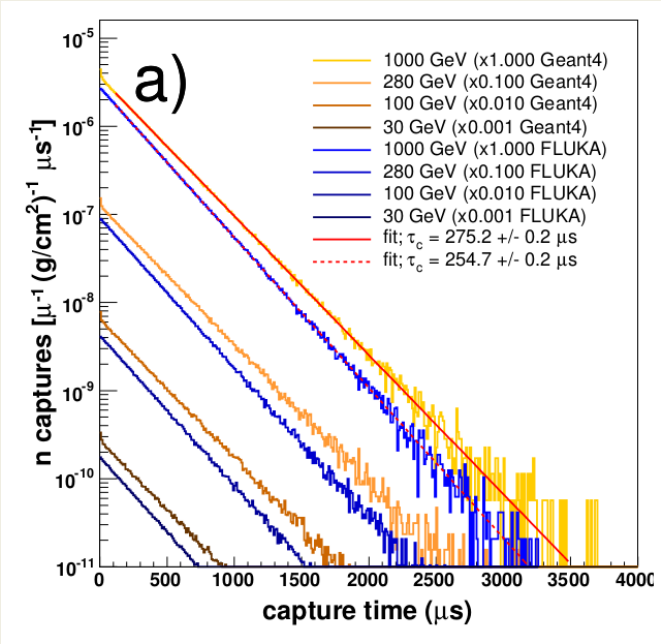
Motivation

- Very little information about muon induced reactions underground
- There is data available for neutron absorption time spectrum, the neutron absorption lateral distance, the neutron capture multiplicity and the cosmogenic isotope production.
  - Mainly from Borenixo and KamLand

- Our task is to compare the predictions of Fluka and Geant4
  - Because of the complexities in prediction the isotope production rates and the large variation in the production rates, an agreement with data and between the code by a factor of 2 is acceptable

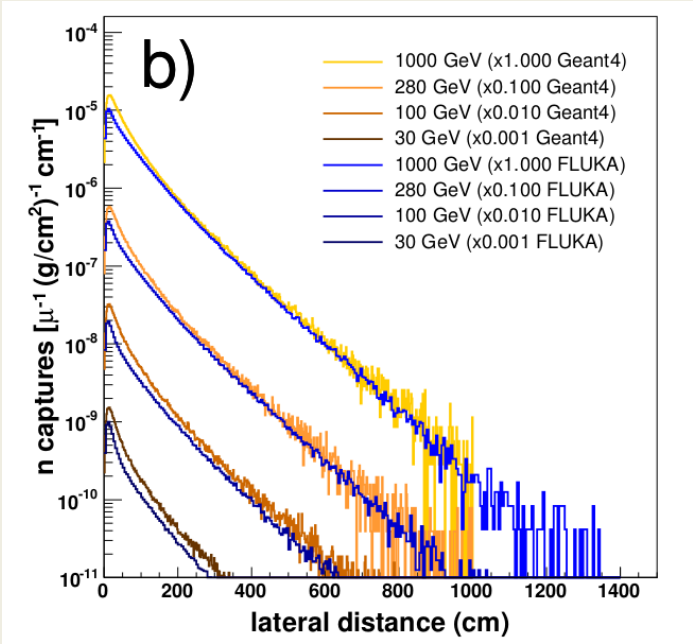
Neutron Capture Time and Lateral Distance

Neutron Capture Time



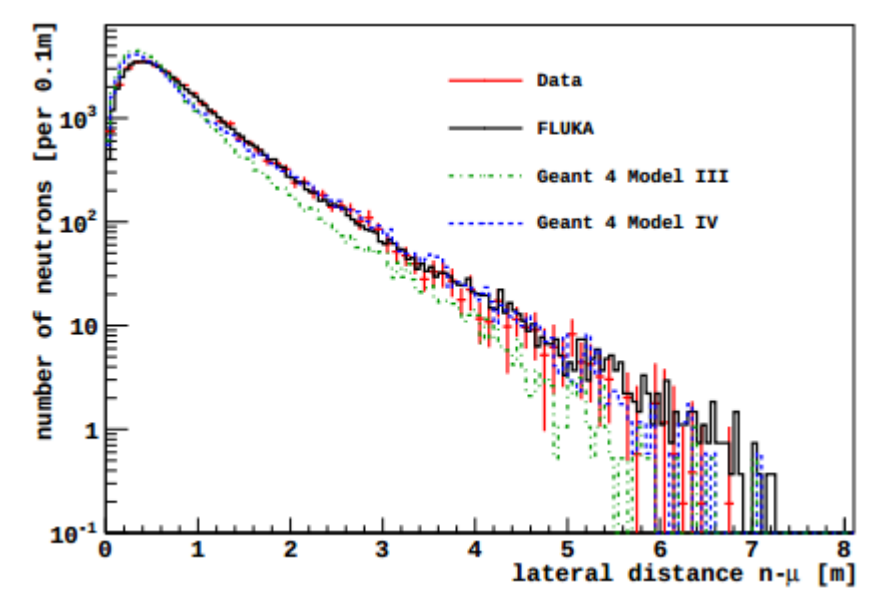
Fluka and Geant4 results for Liquid Scintillator

Neutron Lateral Distance



Fluka and Geant4 results for Liquid Scintillator

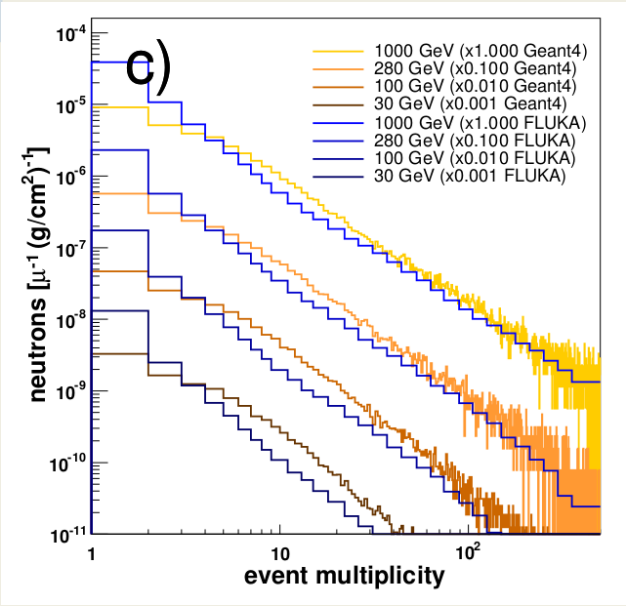
Lateral Distance Comparison



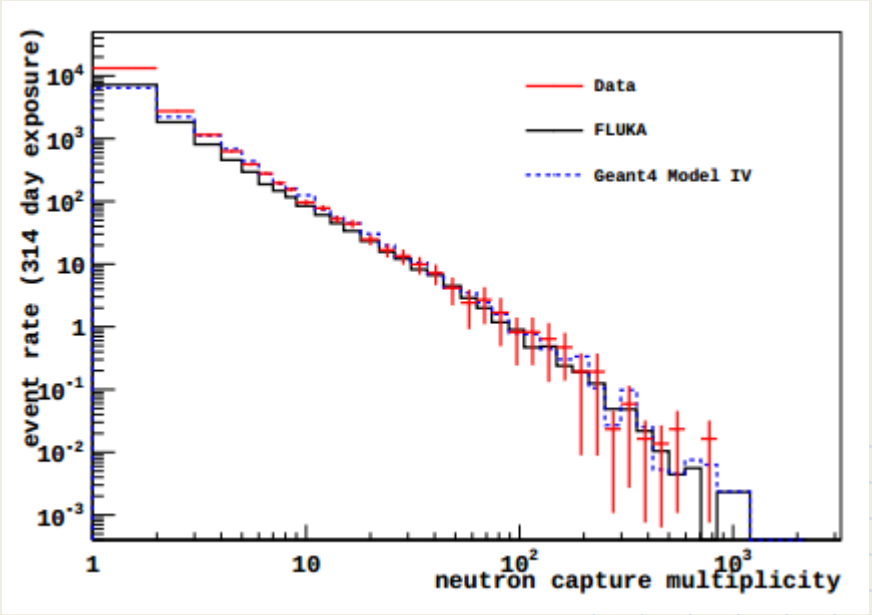
Comparison of the Fluka and Geant4 results to available Borenixo data at around 280 GeV

arXiv:1304.7381 - JCAP 08 (2913) 049
Note difference for Geant4 models III and IV

Neutron Capture Multiplicity

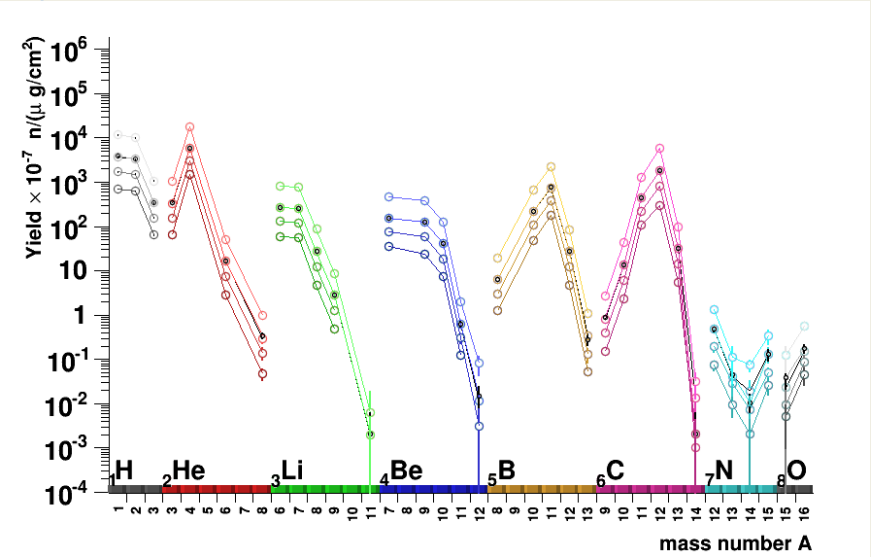


Neutron Capture multiplicity for Fluka and Geant 4

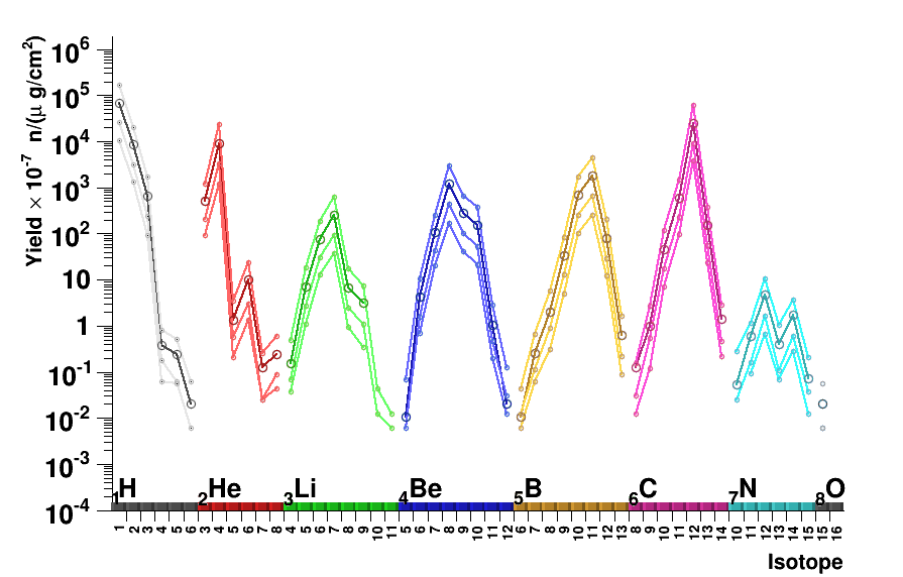


Comparison of multiplicity with available Borenixo Data

Isotope Production Liquid Scintillator

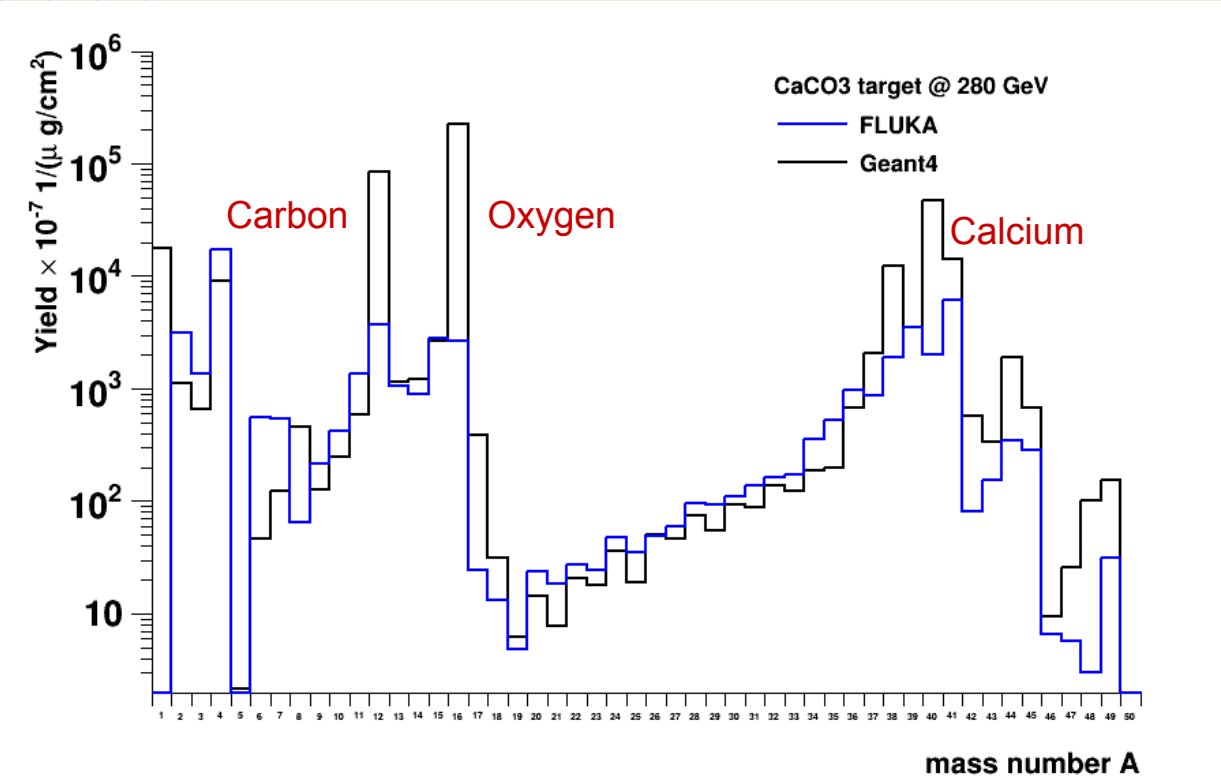


Fluka at all energy levels



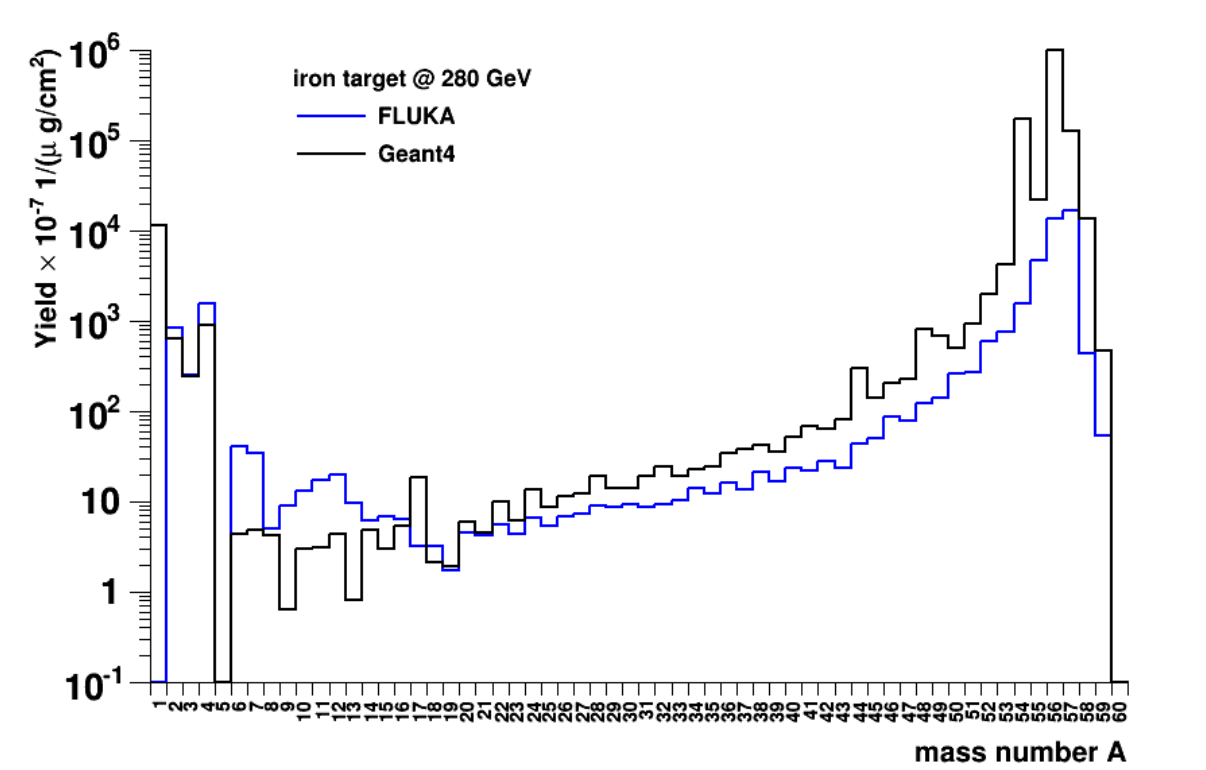
Geant4 at all energy levels

Isotope Production In Calcium Carbonate



The large discrepancies between the codes is visible at the naturally occurring isotopes in the targets. For Fluka low energy elastic scattering is not included in the standard residual isotope count. - but is available through user routines. What is the energy limit for low energy elastic Scattering in Geant4?

Isotope Production in Iron



Website for Fluka Info

The website for all the Fluka related work has changed to: http://fluka.phys.uh.edu/aarm/