LIME background simulation

CYGNO simulation meeting – 21/10/2021

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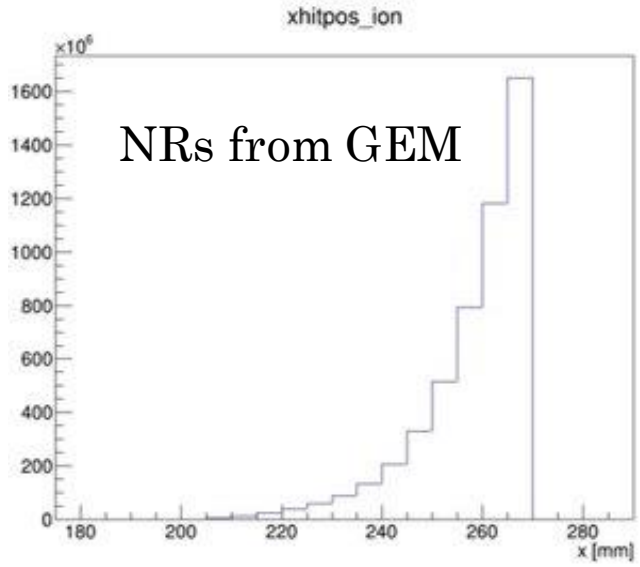
Simulation tasks – background

- **LIME internal background**
  - GEM – done and analysed
  - Acrylic box – done and analysed
  - Field cage – done (to be analysed)
  - Resistors – to do (~200 hr)
  - Cathode – to do (~200 hr)
  - PMT, GEM supports, internal structure… – to do (?)
  - Copper and resistors activity is being measured by M.Laubenstein



Contribution	10^5 ER/yr (0-20 keV)	10^5 ER/yr (all)	NR/yr (0-20 keV)	NR/yr (all)
GEMs	0.69129	3.83753	311.62	17573.0
Acrylic Box	0.5245	2.7054	0	0

Note: for the acrylic box Po212 is missing because the simulation stopped (alpha 8.8 MeV)

Simulation tasks

- For the camera body+lens simulation I need the CAD design of the shielding

- **SRIM ion simulation**
  - Carbon and fluorine ions simulation for 12, 14, 16, 18, 20, 22, 24, 26, 28, 35, 40, 45, 50, 55 keV (to match the simulated He energies) - done
  - The computed ionization profiles are all uploaded on LNGS cluster

- **Digitization NR tracks** – 1000 ions, random drift, random direction
  - Done for 1,3,6,10,30,60,100 keV for He, C and F + 12, 14, 16, 18, 20, 22, 24, 26, 28, 35, 40, 45, 50, 55 keV for He
  - Digitization of C and F at 12, 14, 16, 18, 20, 22, 24, 26, 28, 35, 40, 45, 50, 55 keV (ongoing)
  - I tried to run the reconstruction code on LNGS cluster but it gets stuck

Neutron simulation

- I got some interesting comments on my presentation for the admission to the 3rd year of PhD
- (α,n) reactions inside the shieldings can become significant, they must be taken into account
- GEANT4 is not the best program for neutron yield calculation (problems especially at low energy)
  - **MCNP** (Monte Carlo N-Particle) Transport Code, is usually used for neutron transport and interaction
  - **SOURCES4C** - A Code for Calculating (α,n), Spontaneous Fission, and Delayed Neutron Sources and Spectra
  - **SaG4n** – GEANT4 tool for (a,xn) simulations http://win.ciemat.es/SaG4n/
  - **MUSUN** (MUon Simulations UNderground)
  - We could also do a simulation of the expected neutron spectrum underground to be compared with the future measurement