CYGNO simulation tasks

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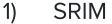
11/01/21
CYGNO simulation meeting

Tasks & people

1. SRIM ➡ André and Flaminia with Davide coordination
2. Toy MC ➡ Atul and Mariana with Fabrizio and Giulia coordination
3. Reco & Analysis ➡ Samuele and Atul with Emanuele coordination
4. Neutrons in LIME ➡ Flaminia with Elisabetta coordination
5. Neutrinos in CYGNO ➡ Samuele and Giorgio with Elisabetta coordination
6. Dark matter in CYGNO ➡ Giorgio with Elisabetta coordination
7. Migdal effect in LIME/CYGNO ➡ Stefano with Andrea Coordination

8. Bayesian tool for limits and sensitivity ➡ Giorgio and Stefano with Andrea coordination

Simulation tasks (1)

0)   GEANT4 simulation for CYGNO/LIME

      a) background study: internal and external background

      b) shielding optimization

1)   SRIM

    a)   check calculations of the quenching factor made by E. Marconato

    b)   introduce effect due to secondary ionization

2)   Toy MC

    a)   CMOS noise simulation + GEM gain fluctuations + diffusion vs z

    b)   PMT simulation

3)   Reco & Analysis

    a)   tune reconstruction parameters for new data in LIME

    b)   study reconstruction performance on MC

    c)   study ER/NR separation

need to setup parallel simulation on cluster

CMOS part:
W-value & cluster simulation to be improved,...

...in progress

Simulation tasks (2)

4) Neutrons in LIME

    a)   MC simulation: Geant4 (energy deposit) + SRIM (NR tracks)

    b)   digitization (toy MC) + analysis

(?) not yet started

5) Neutrinos in CYGNO

a) MC simulation: Geant4 ER tracks

b) digitization (toy MC) + analysis (directionality studies)

c) sensitivity study

…in progress

6) Dark matter in CYGNO

a) MC simulation: SRIM NR tracks

b) digitization (toy MC) + analysis (ER rejection study)

c) sensitivity study

…in progress

7) Migdal effect

a) MC for feasibility study

not yet started

Discussion

- We think to finalize work and write some papers on simulations
- Maybe start writing internal notes?
  For example:
    - background study, (similar to T-REX paper https://arxiv.org/abs/1812.04519)
    - study of ER/NR discrimination power using simulations (similar to CYGNUS paper: https://arxiv.org/pdf/2012.13649.pdf)
    - other?