CYGNO simulations update

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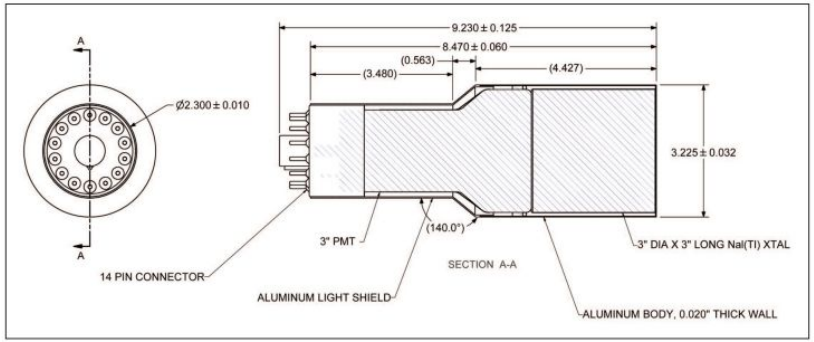
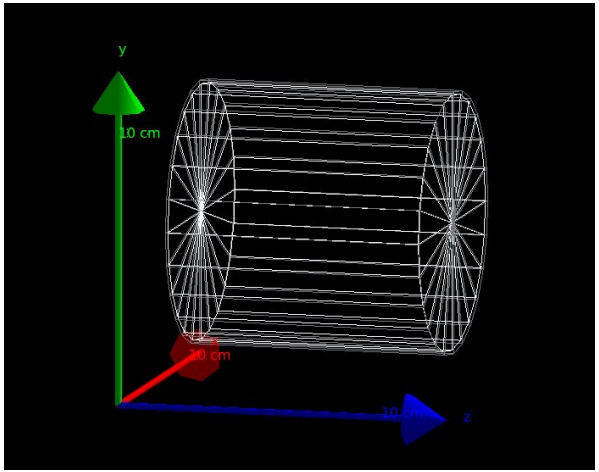
13/06/23
CYGNO simulation meeting

Simulation of NaI crystal

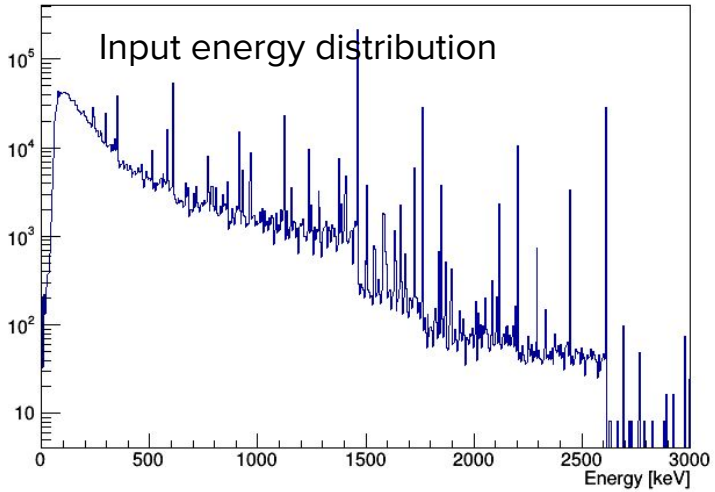
- 3”x3”cylindrical crystal with 0.5 mm Aluminum case

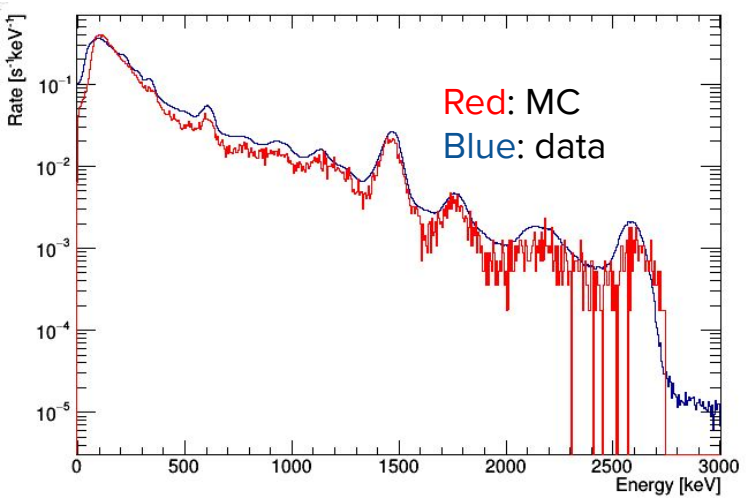




External gamma in NaI

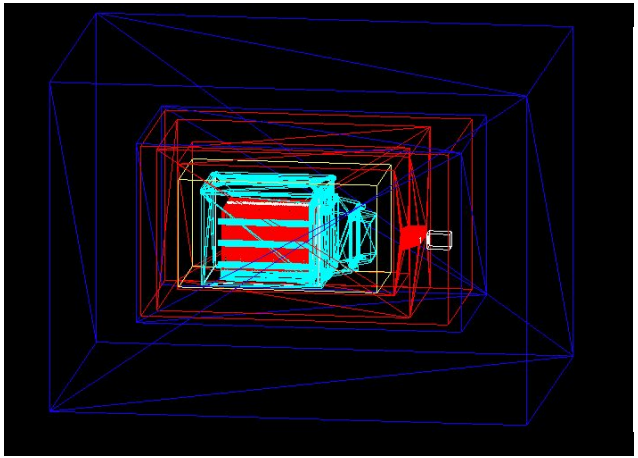
- Generate gammas according to the energy distribution obtained from deconvolution of NaI data
- Isotropic generation from a spherical surface of R=21 cm (10^7 events)
- Normalized to 0.58 gammas/cm^2/s, Nflu ➜ gammas entering 3.48 10^6
  ➜ t_eq = Nflu/(Flux Area) = 1084 sec
- **Rate NaI [E>20 keV] = 91.3 Hz**

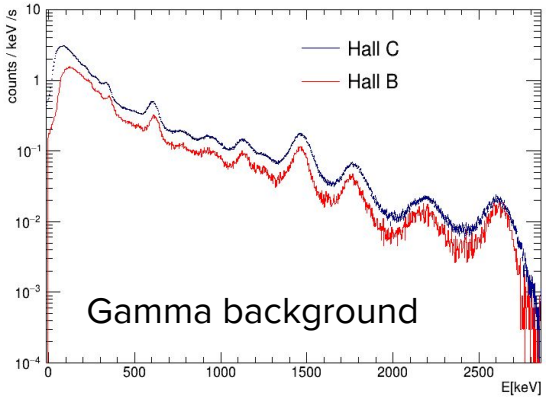


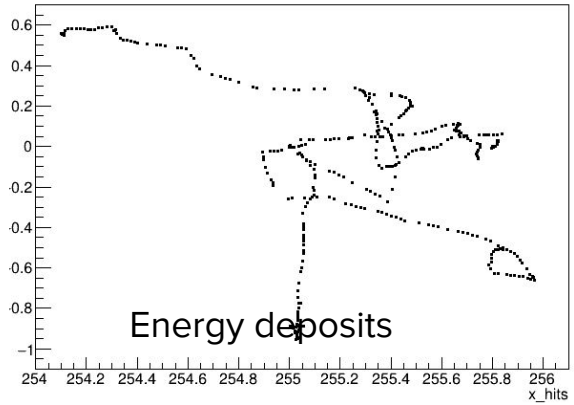


Geant4 simulation of LIME

- Geometry from CAD designs
- External gammas from NaI measurements, shieldings turned OFF

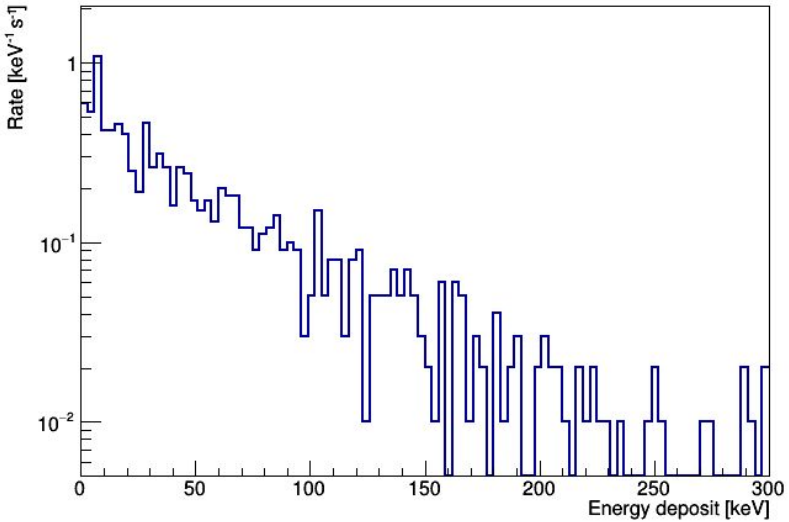






External gamma in LIME

- Generate gammas from previous measurements taken at LNGS with NaI by SABRE
- Isotropic generation from a spherical surface of R=330 cm (10^8 events)
- Normalized to 0.58 gammas/cm^2/s, Nflu ➜ 1.65 10^6
  ➜ t_eq = Nflu/(Flux Area) = 33.2 sec
- **Rate LIME [E>20 keV] = 19.3 Hz**



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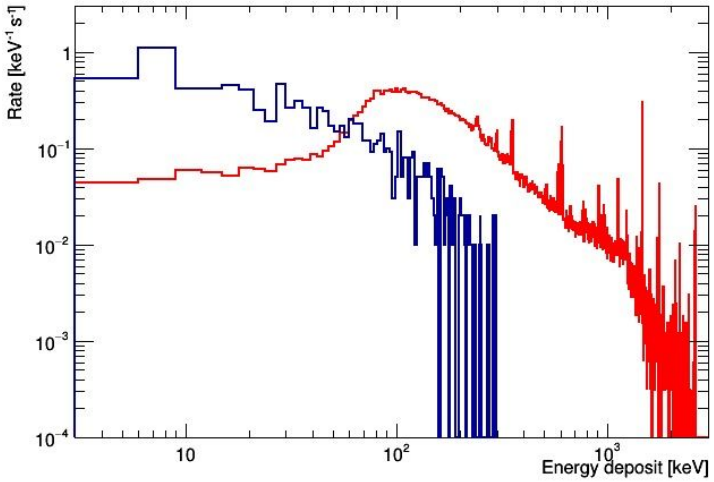
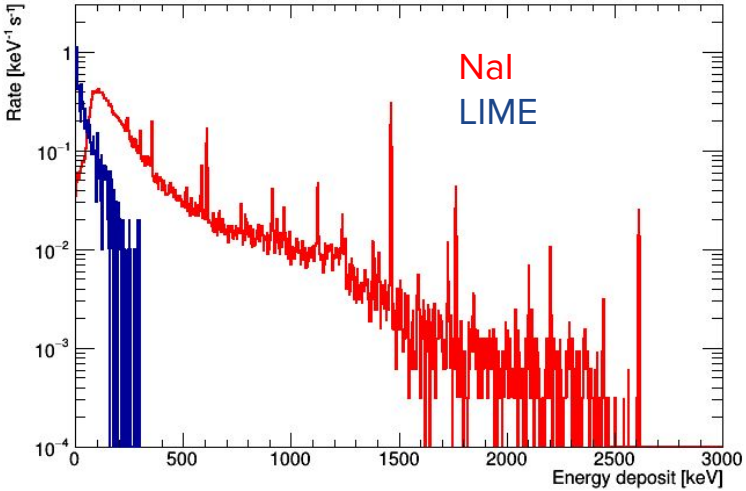
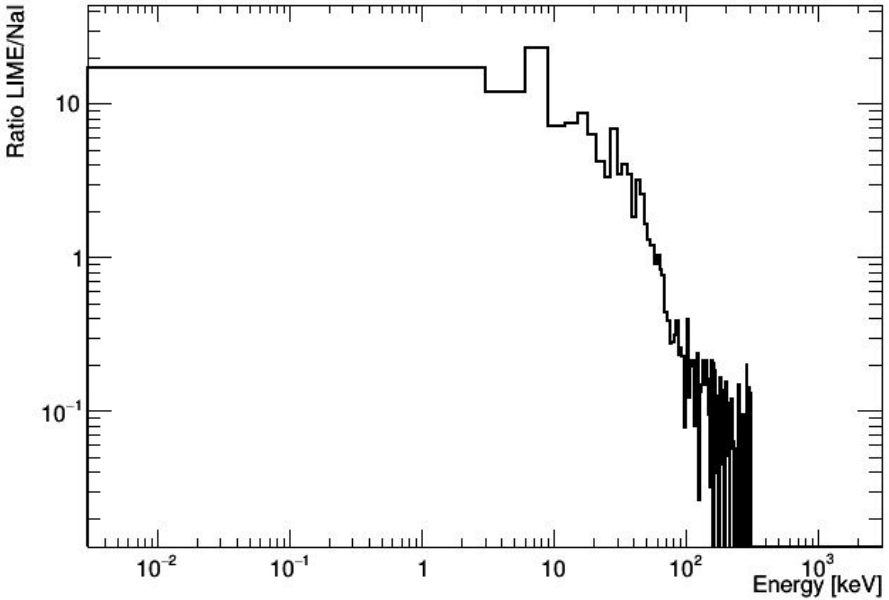
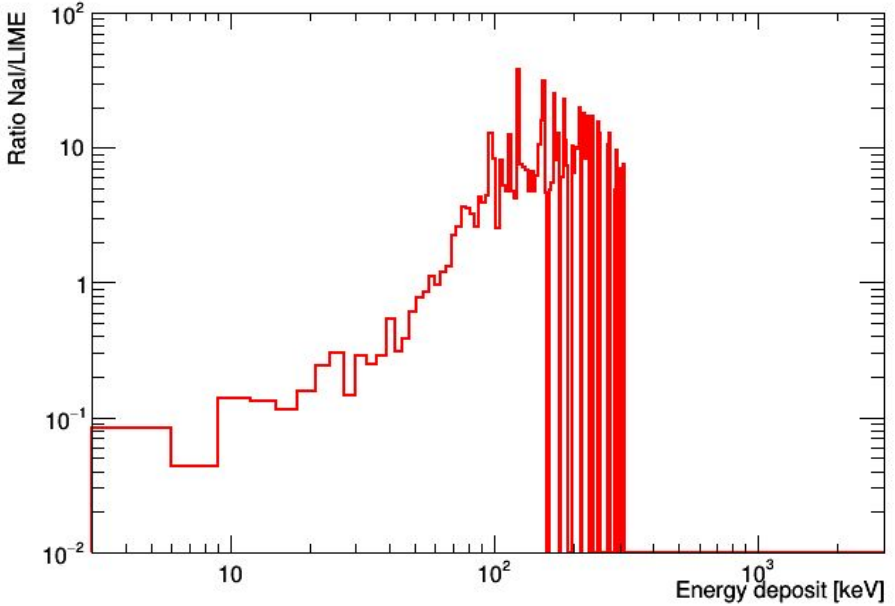




Ratio


Ratio LIME/NaI
10
1
10^{-1}
10^{-2}
10^{-1}
1
10
10^{2}
10^{3}
Energy [keV]


Ratio NaI/LIME
10^{2}
10
1
10^{-1}
10^{-2}
10
10^{2}
10^{3}
Energy deposit [keV]

Conclusions

- Assuming a common threshold of 20 keV there is a **factor 4.5 +/- 0.5** between the rates of NaI detector and LIME

- Note that the input spectrum for LIME simulation is still the old one (directly the NaI spectrum from SABRE measurements)

- The normalization is made with the same method and assuming the same flux of 0.58 gamma/cm^2/s obtained from NaI measurements in LIME experimental area