

1st National Workshop on GEANT4 and its Application to High Energy
Physics & Astrophysics
TUTORIAL I-A, MMD

AIM: Construction a NaI crystal array γ -ray detector and observation of the spectrum for a mono-energetic γ -ray source in terms of the deposited energy.

NaI detectors are inorganic scintillation-type detectors where NaI is the scintillator material. It is sometimes doped with thallium(Tl) which acts as an activator. Such detectors are available with a large variety of form factors and sizes, and they offer very good performances and resolutions for nuclear spectroscopy applications in particular.

TASKS

A. NaI crystal Array:

- Construct NaI crystals of dimension $5\text{cm} \times 5\text{cm} \times 5\text{cm}$ each.
- Construct a cylindrical array of 9 rings, each ring having 32 crystals. [Hint: construct the crystal once, and then replicate it and give appropriate locations]
- Choose the radius of the ring such that the crystals are compactly arranged.
[You may use NaI density as 3.67 g/cc. Also examples/basic/B3 be be useful.]

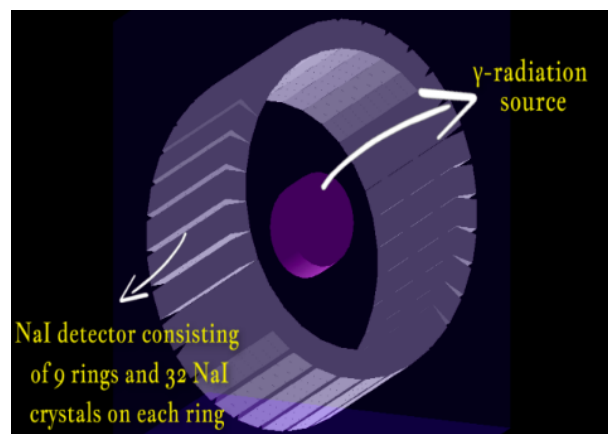


Figure 1: A sample of the detector array, created in GEANT4.

Continued

B. The γ -ray source

- Construct Source-I: An isotropic γ -ray emission ($\lambda = 450$ nm) from the center.
- Construct Source-II: A suitable radioactive γ -ray source.

C. Physics processes

- Construct the physics list with all the necessary processes.

D. Visualization

- The detector set-up
- γ -rays through the detector

D. Energy deposition in the detector

- Tutorial I-B.
