Simulation Geometry in GEANT4

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Outline

Priliminary Geometry Design

1. scintillator cubes $10 \times 10 \times 10$
2. flat film as neutron detector: 4layers
3. six light guide arrays
4. six PMT [SiPM] arrays

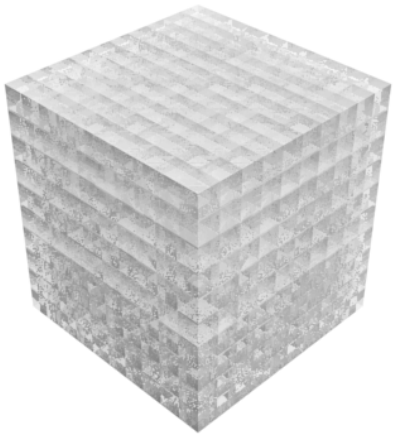


图: scintillator cube

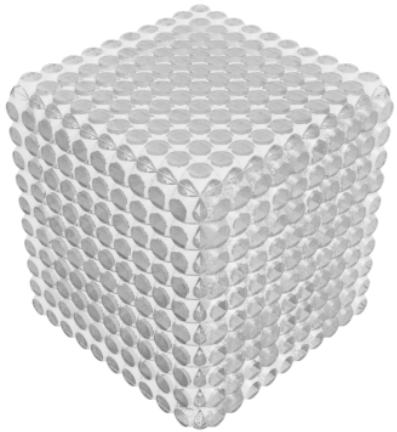


图: scintillator cube+light guide

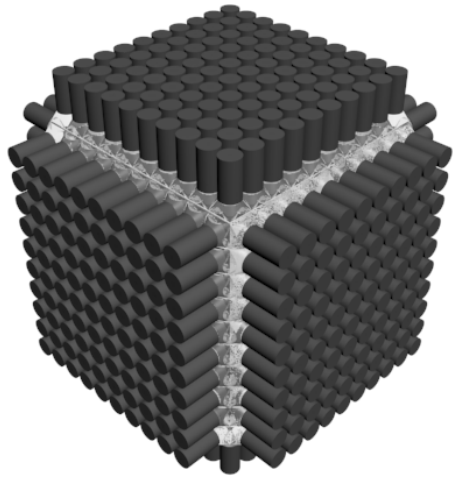


图: scintillator cube+light guide+PMT

Details about the Geometry Set-up

The structure of one dimention detector:

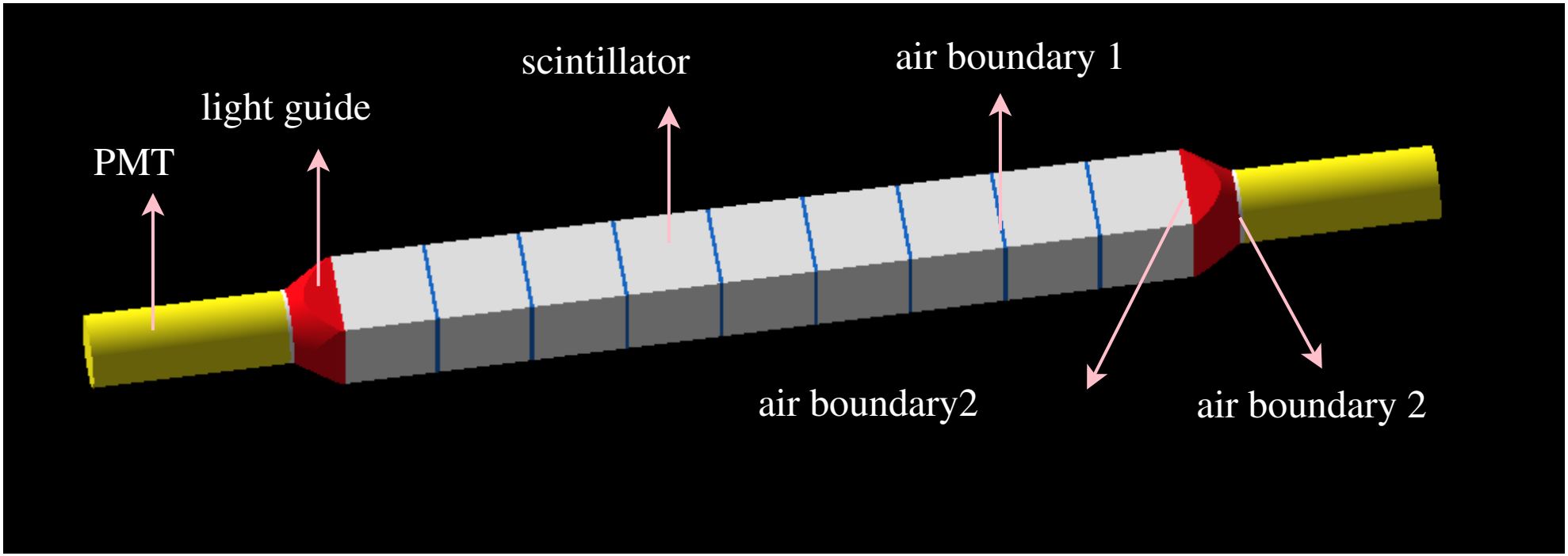


图: Geometry structure:PMT-lightguide-scintillator-air boundary between [scintillators;scintillator and lightguide;lightguide and PMT cathode]

Details about the Geometry Set-up

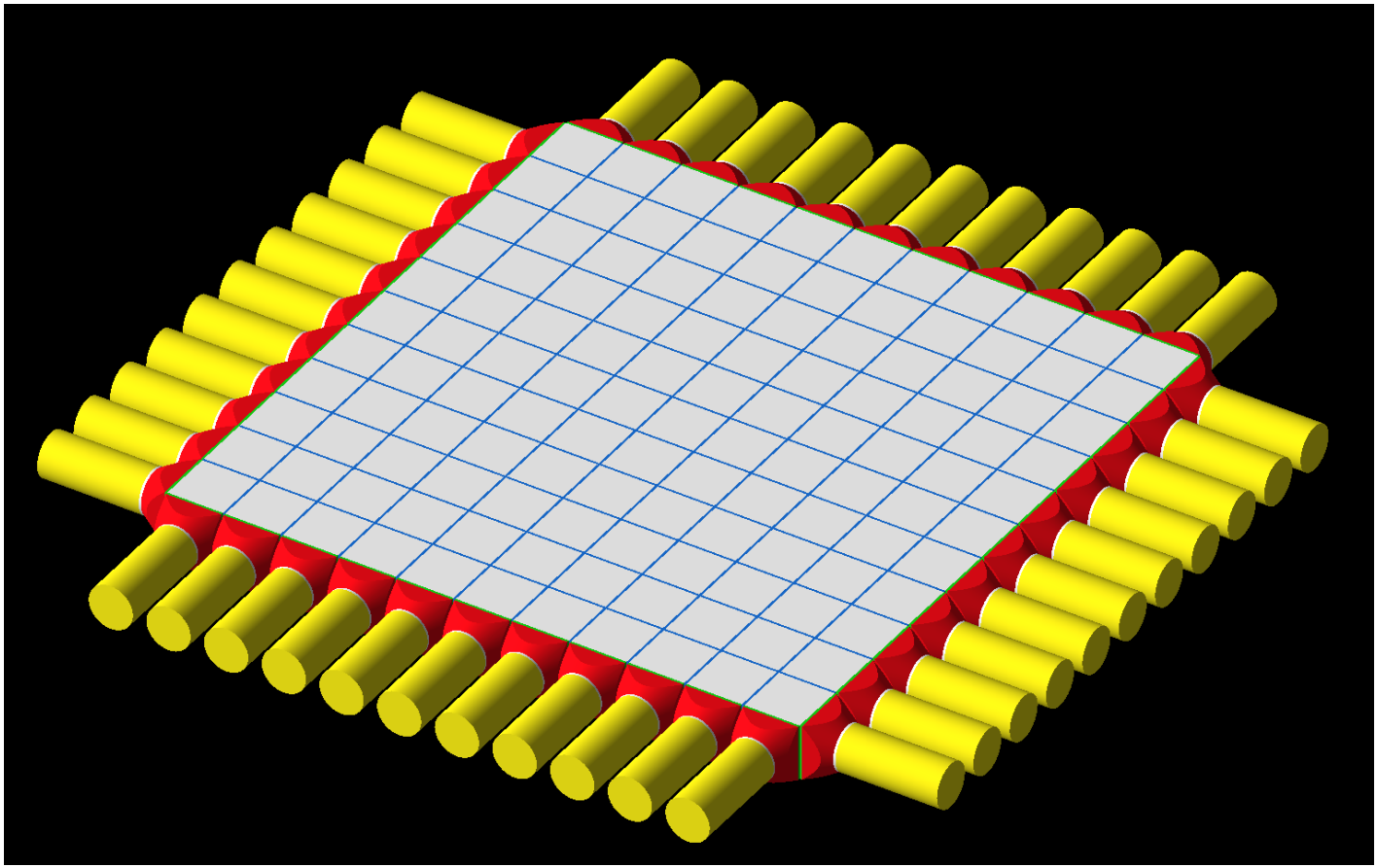


图: two dimention detector layout

Details about the Geometry Set-up

Not finished yet.

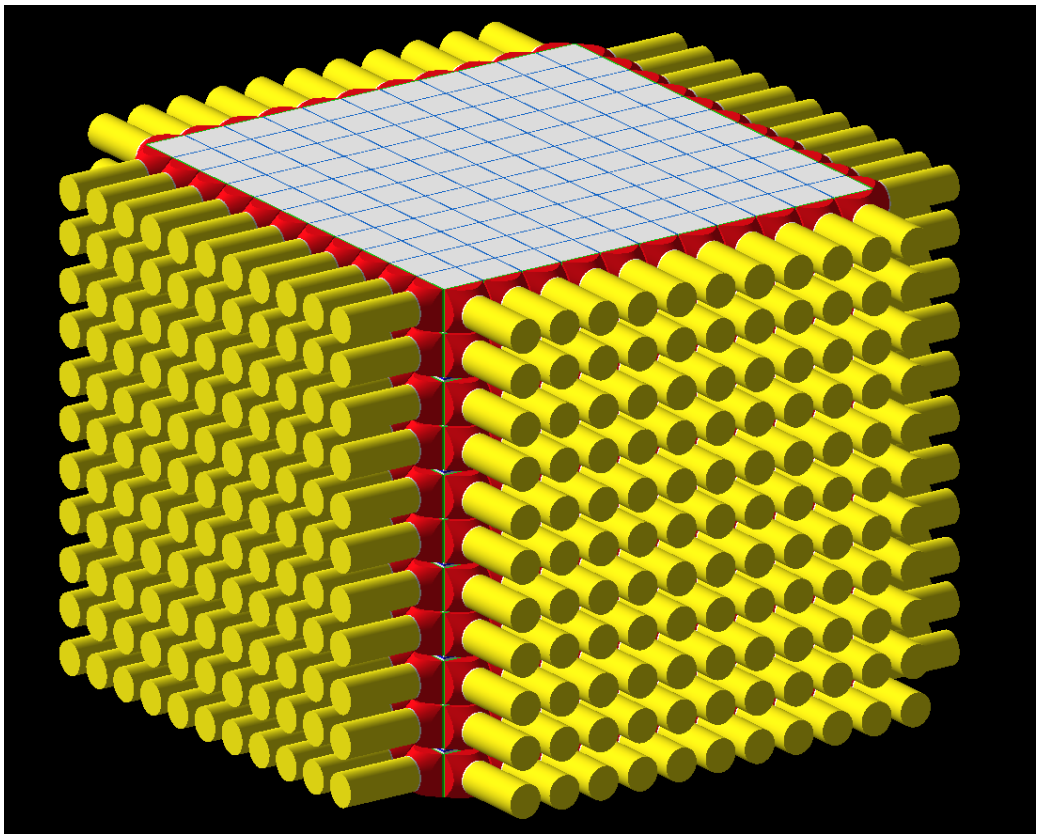


图: 3 dimention detector layout

Details about the Geometry Set-up

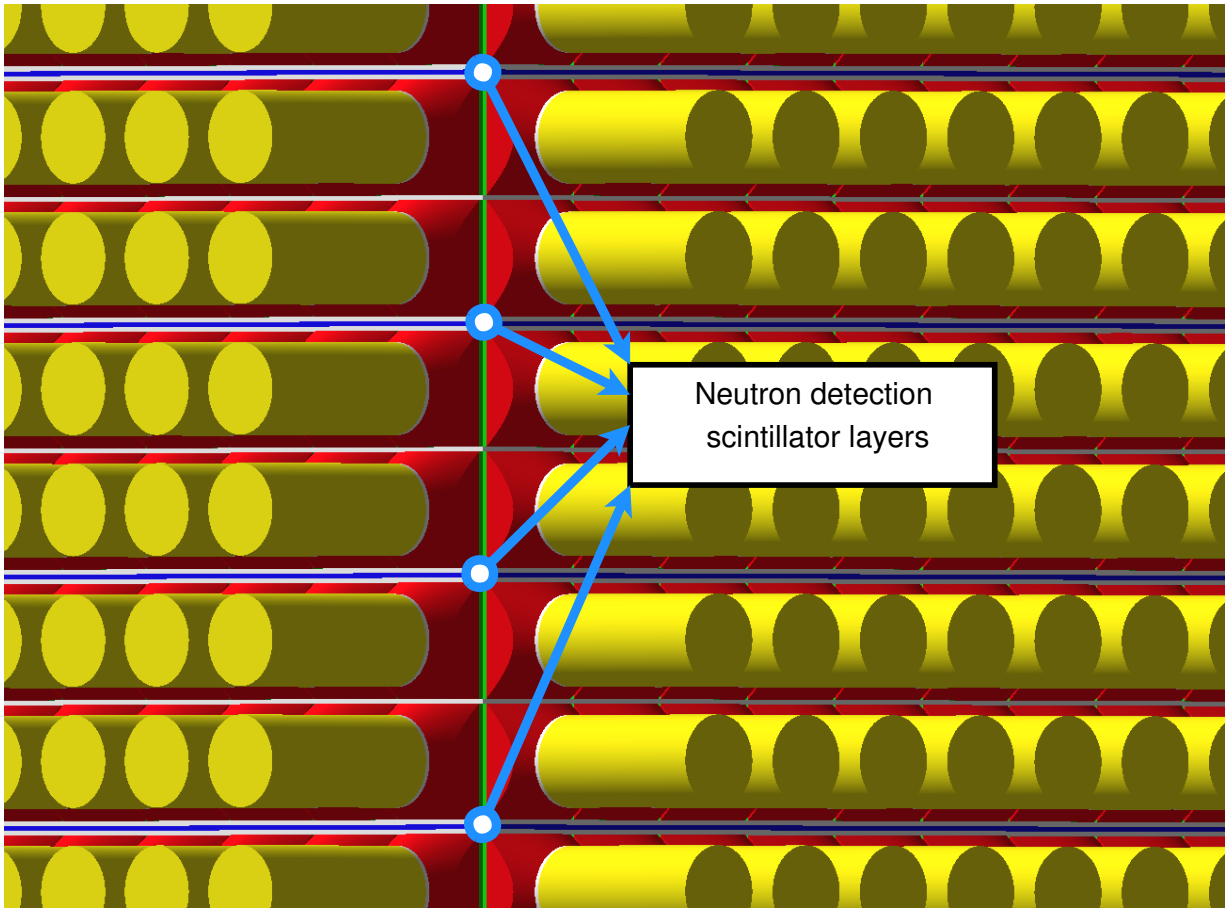
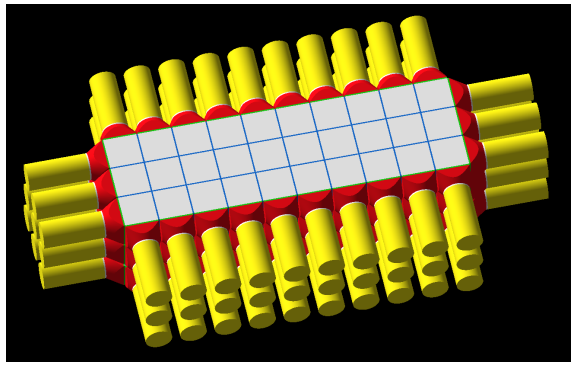
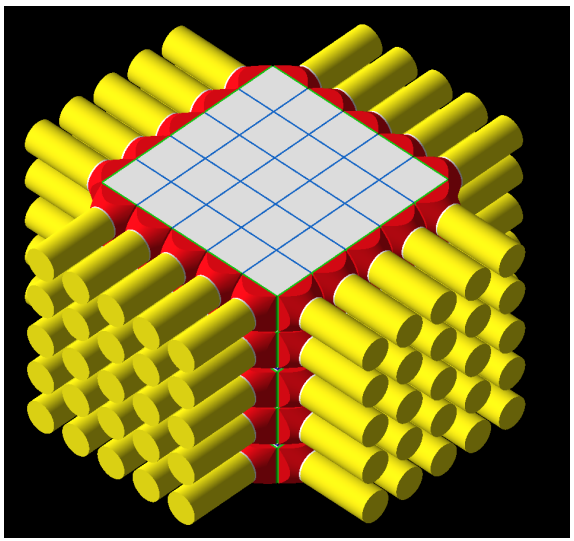


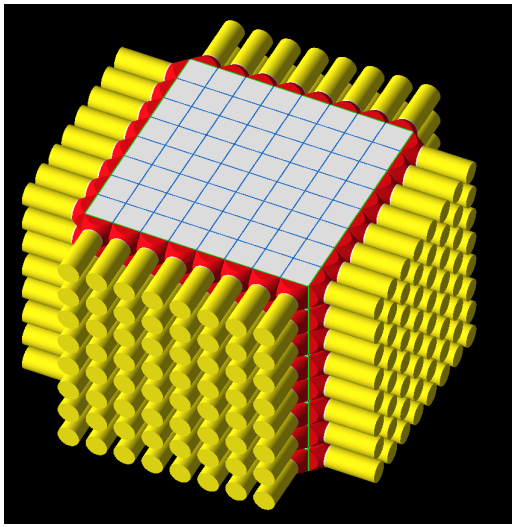
图: neutron detection scintillator layers in the y direction.

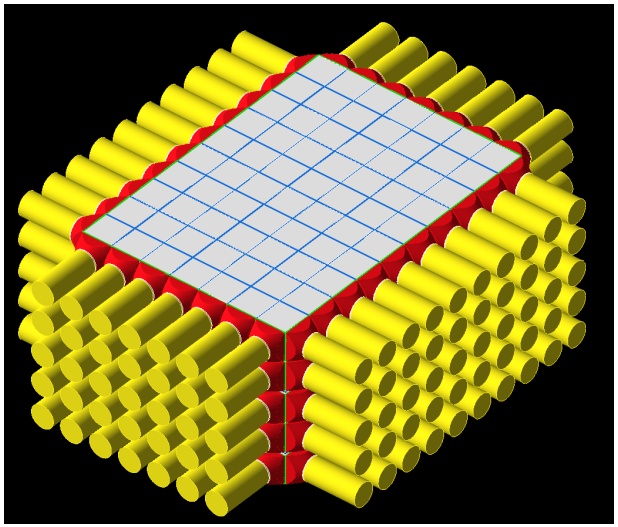
flexiable size adjustment

Easy to change the full detector size according to experimental requirements.









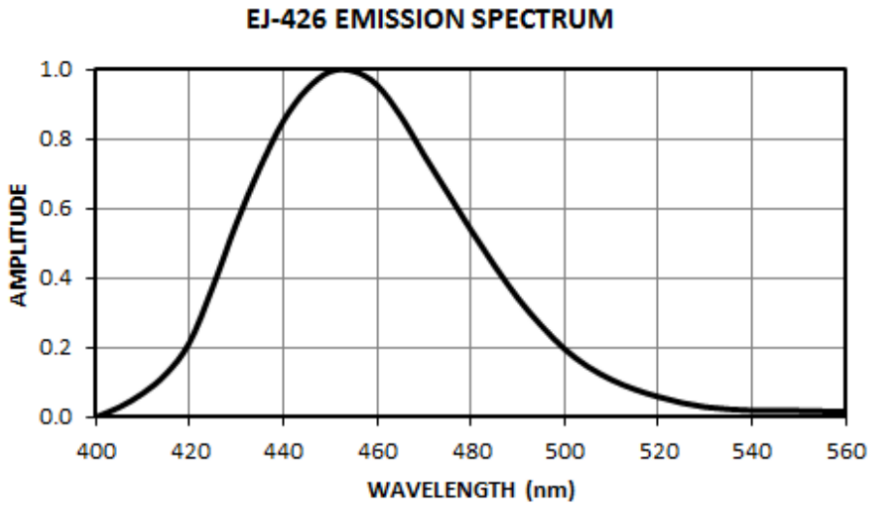
THERMAL NEUTRON DETECTOR

- the neutron detector EJ-426.
- flat white thin sheet,^{6}LiF :(ZnS:Ag)

detection princeple:

$$^{6}Li +^{1} n \rightarrow^{3} H +^{4} He + 4.78MeV \quad (1)$$

The resulting triton and alpha particle are detected by ZnS:Ag phosphor with the broad blue fluorescent spectrum.



DETECTION PROPERTIES			
Screen Type		EJ-426-0	EJ-426HD2
^{6}LiF:ZnS Mass Ratio		1:3	1:2
^{6}Li Density (atoms/cm^{3})		8.81×10^{21}	1.39×10^{22}
Theoretical NTH Efficiency	**0.32 mm thick**	0.23	0.34
	0.50 mm thick	0.34	0.48

parameter adjustment

1. choose the formula: EJ-426-0 or EJ-426HD2 ?
2. switch the thickness: 0.32mm or 0.5mm?
3. sheet size: 60mm$\times$ 60mm?
4. do we need backing material?

BACKING		
MATERIAL TYPE	**DESCRIPTION**	**SUFFIX**
Aluminum Foil	50 µm thick foil	(none)
Clear Polyester Sheet	0.25 mm thick sheet	-PE
	Laminated between two 0.25 mm thick sheets	-PE2
Aluminized Mylar	0.12 mm thick sheet	-AM
Pure Aluminum	0.5mm thick plate	-PA
High Reflective Aluminum	0.4mm thick plate	-A

next to be done

- detector construction .
  - add remain geometry [lightguides and PMTs].
  - attach correct material to each logical volume.
  - other components
- adjustment of physis list
  - about scitillator material and their optical properties
  - optical performance of lightguides
  - response of PMT [SiPM]
  - optical boundaries
- add different primary paticle sources
  - alter the particle type,position,momentum,energy etc.
  - use gps to control theparticle source
- sensitive detector and scoring
- more useractions for output and analyze.

sensitive detector

summary

- almost finish simple detector geometry.
- other parts of simulation program still in progress.

BACK-UP