

Status of Mechanical Studies for a Spherical Design for PARIS

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for the PARIS collaboration

Nov. 2007 to Jan. 2008 ...



LaBr₃ 1st layer

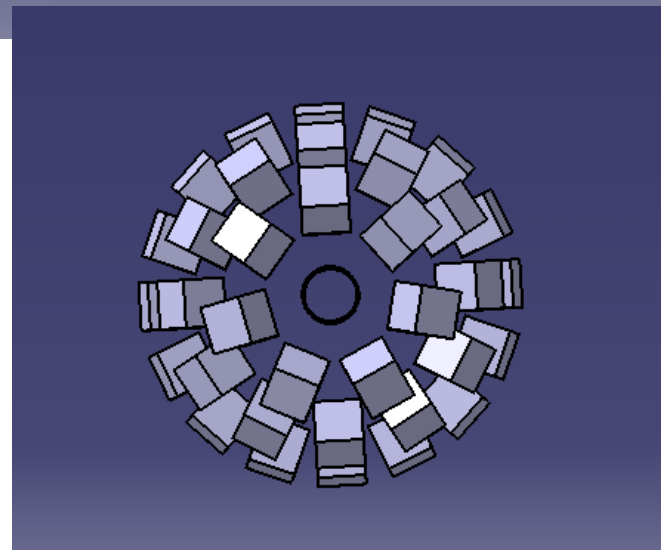
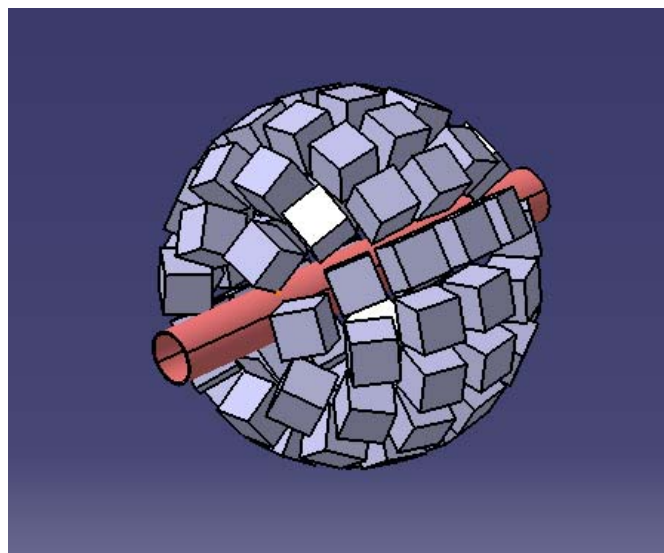
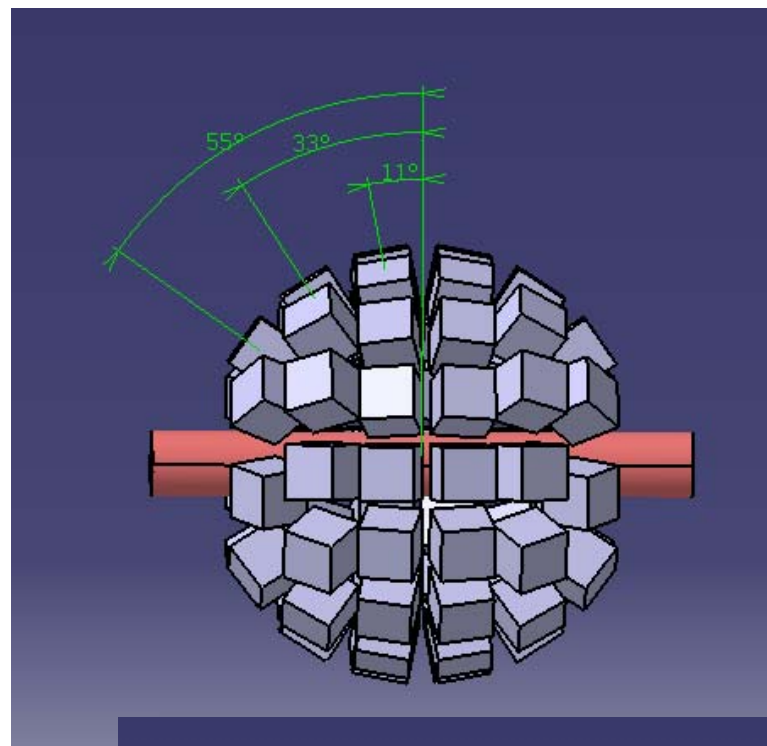
2" x 2" cubic modules

Distance to target 150 mm (Agata)

Minimum distance between modules : 5 mm

Aluminum pipe : 60 mm Ø, 1 mm thick

70 modules, $\Omega = 8.3$ sr



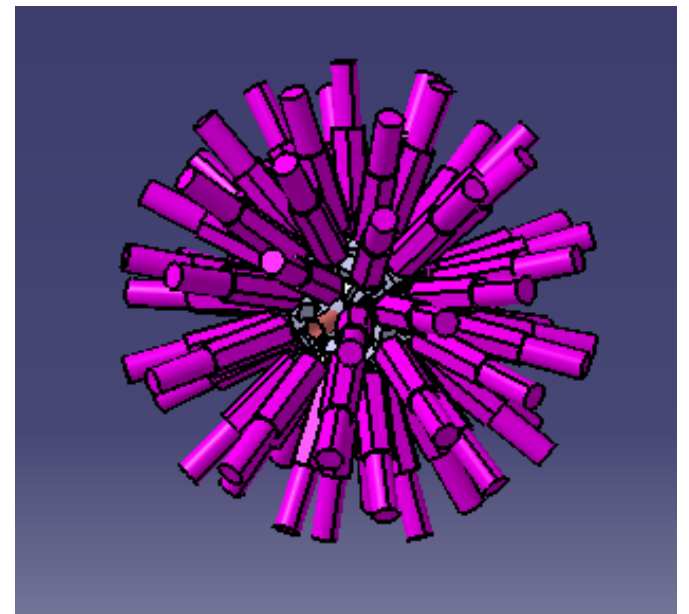
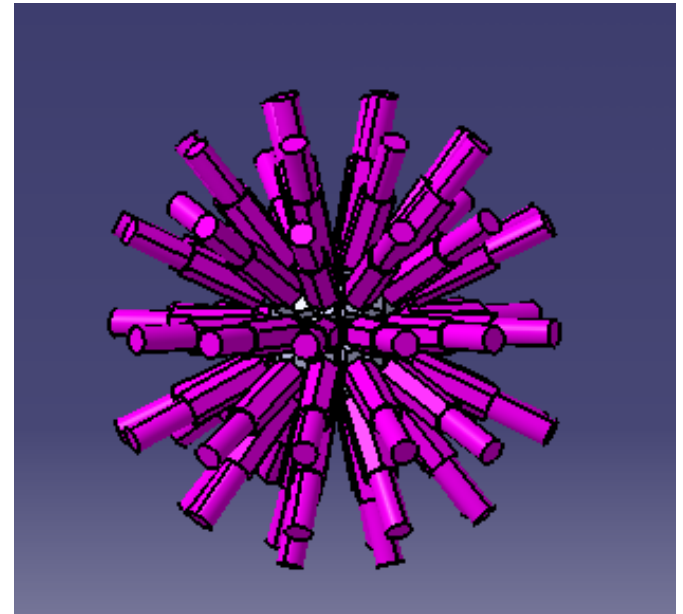
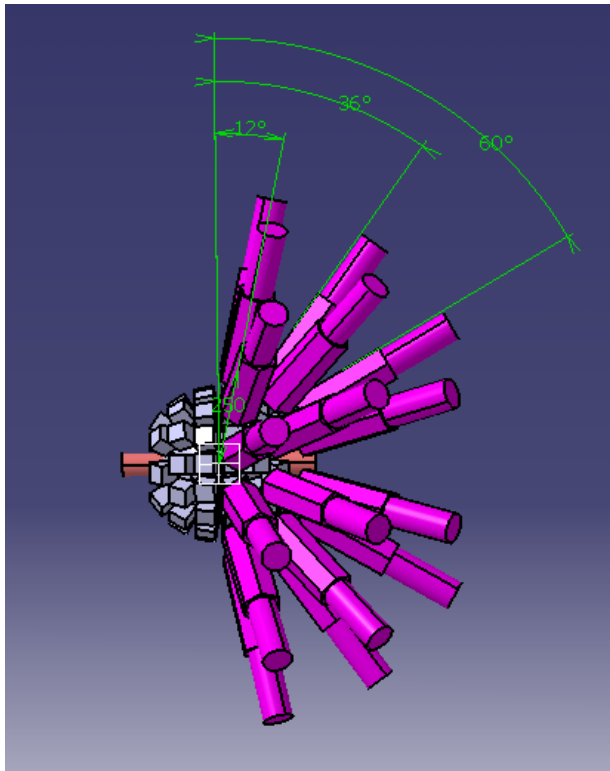
LaBr₃ + BaF₂

BaF₂

Chateau de Cristal type, 70 existing modules

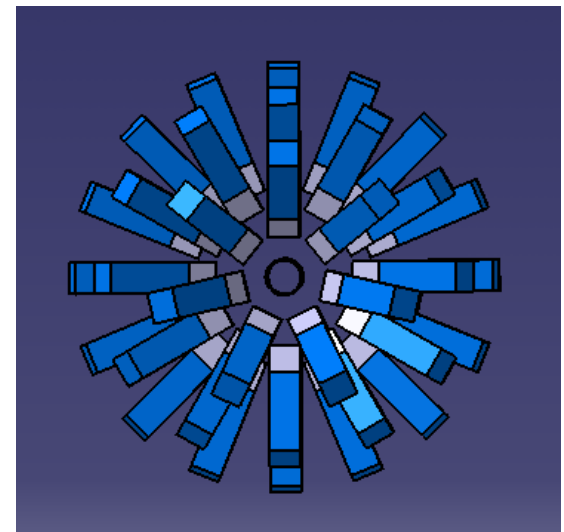
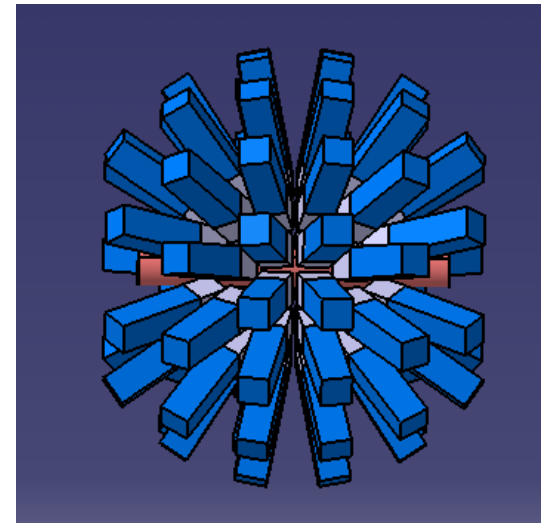
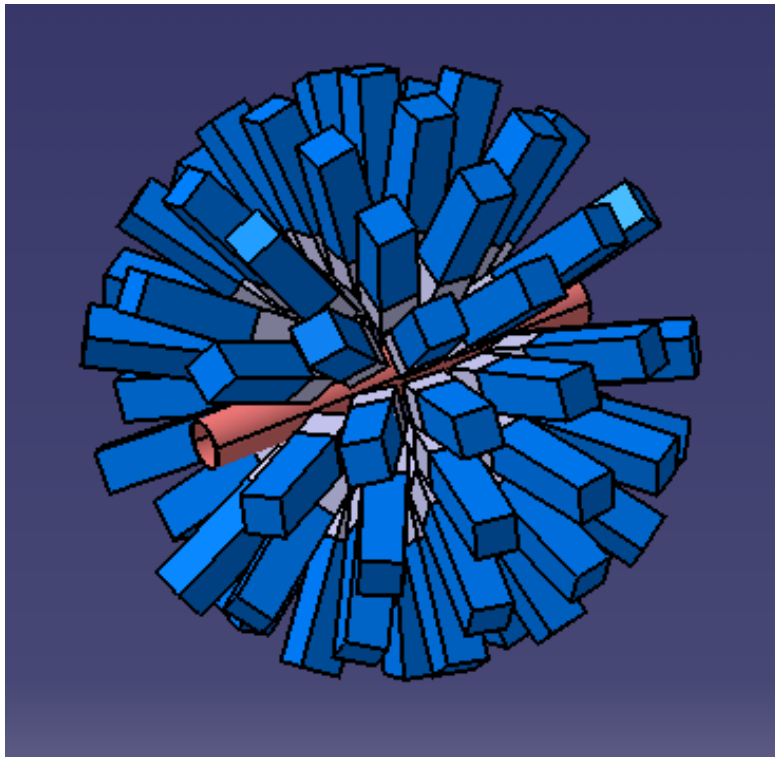
Distance to target 250 mm (LaBr₃ PMT ?)

68 modules, $\Omega = 7.6$ sr

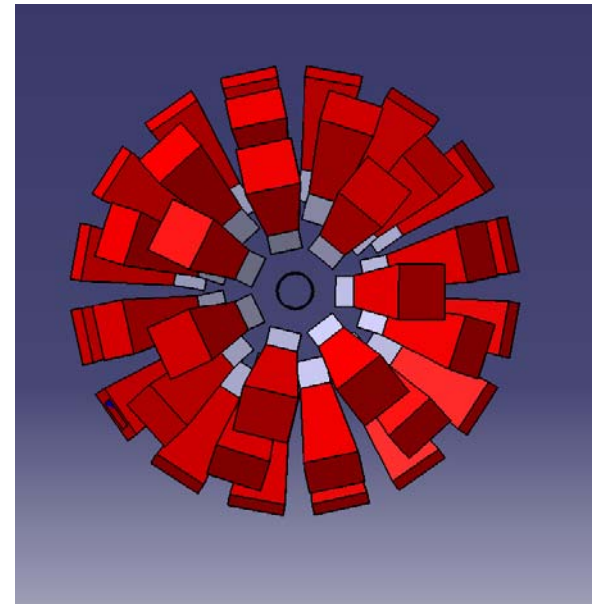
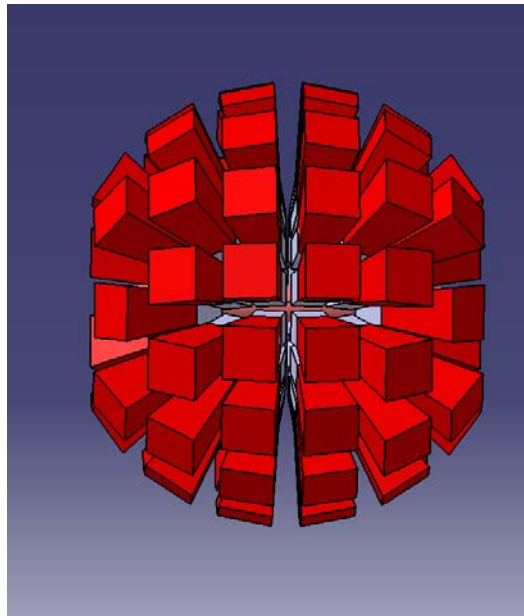
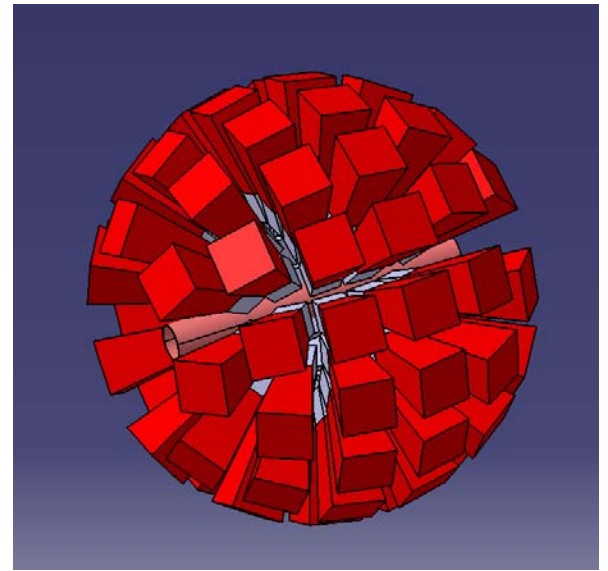
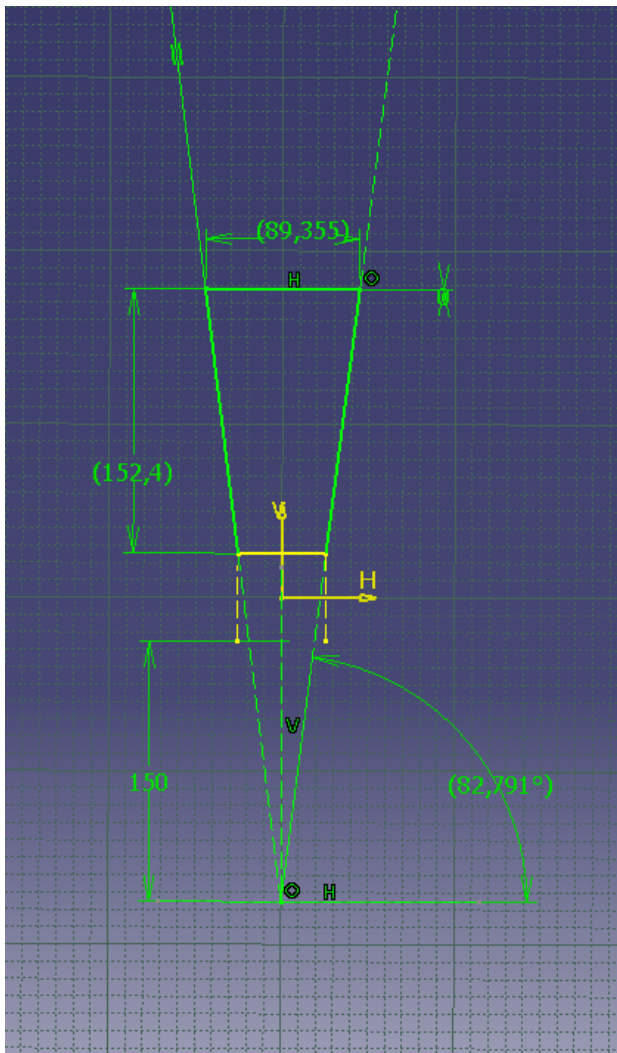


LaBr₃ + CsI, telescope

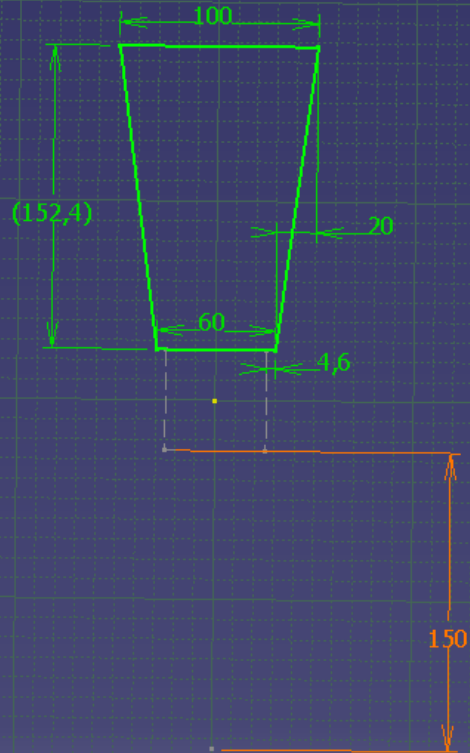
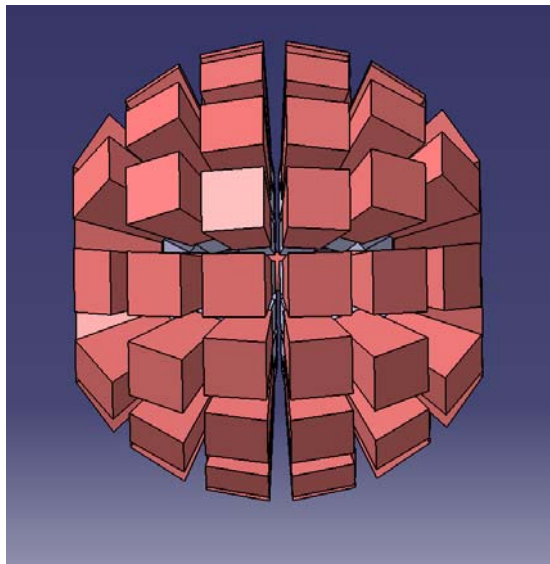
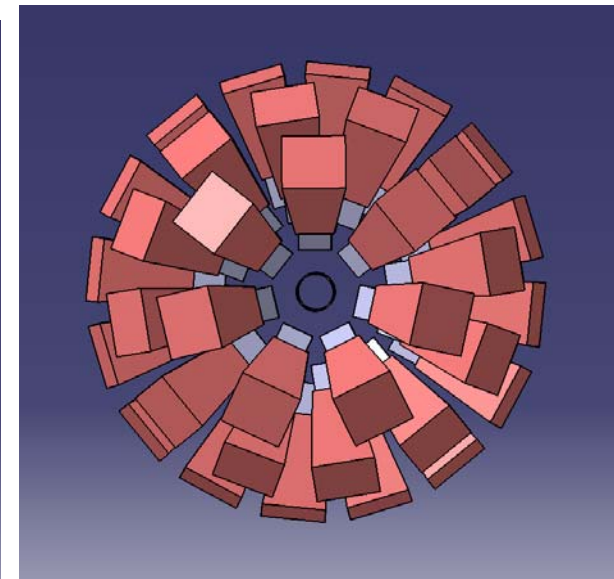
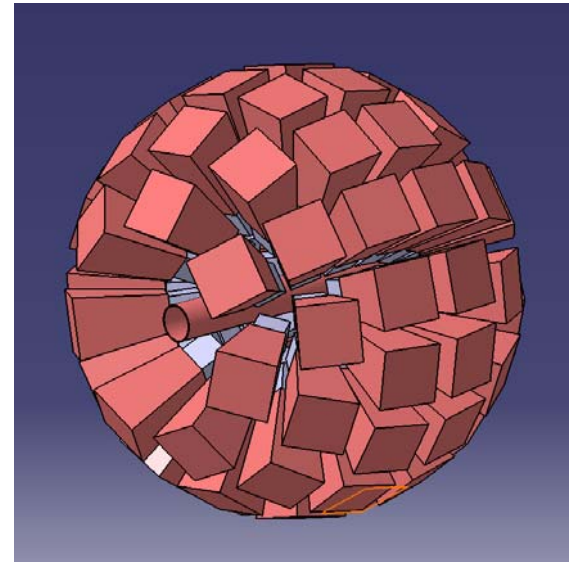
Same LaBr₃ inner sphere (2"x2"x2")
+ CsI (2"x2"x6")



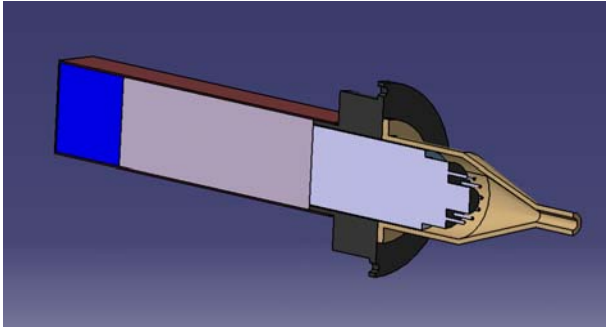
LaBr₃ + CsI, telescope



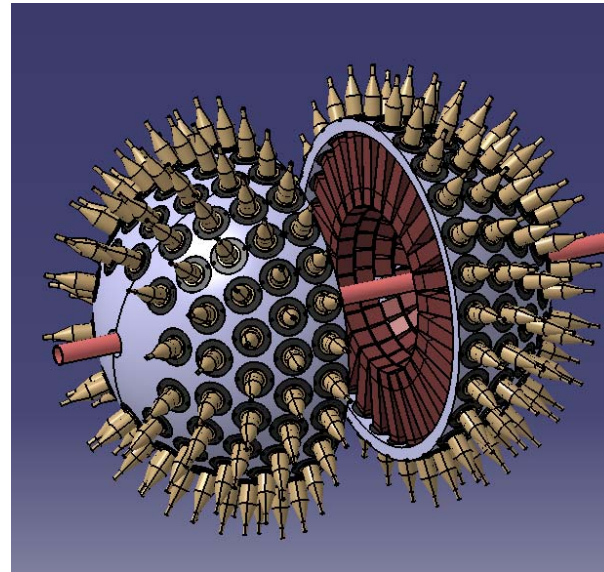
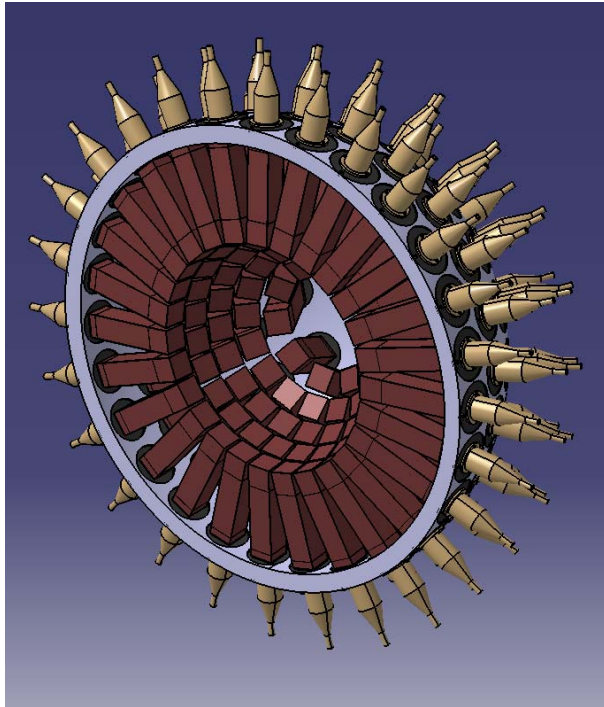
LaBr₃ + CsI, telescope



200 detectors LaBr_3 + CsI, full array



1 module
PMT : RC580 Hamamatsu
1mm carbon foil



200 phoswiches spherical structure
5 mm min between modules
60 mm diameter aluminum pipe

200 phoswiches / G4 simulations Absorption / spectra

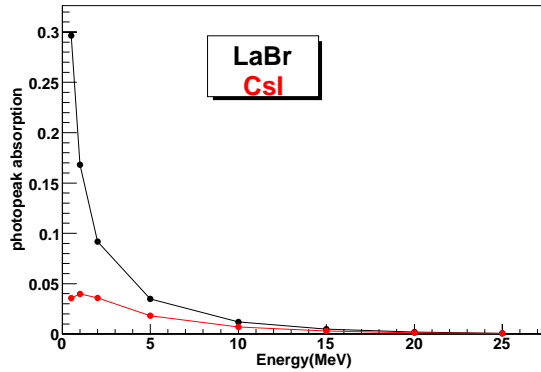
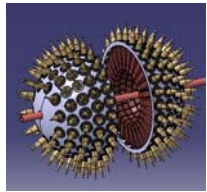


Fig. 15. : Photopeak absorption, no add back.

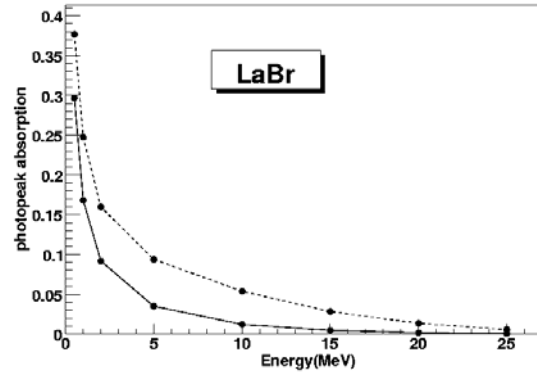


Fig. 16. : Dashed curve : photopeak absorption, ideal add back.
The plain curve corresponds to no add back.

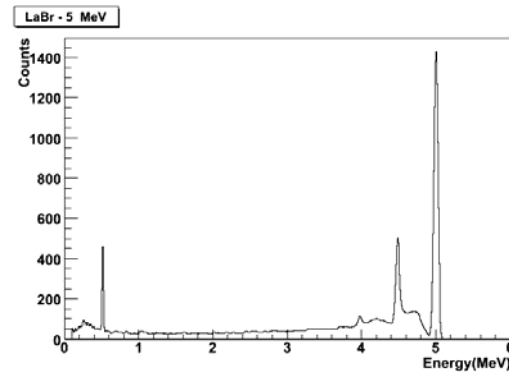
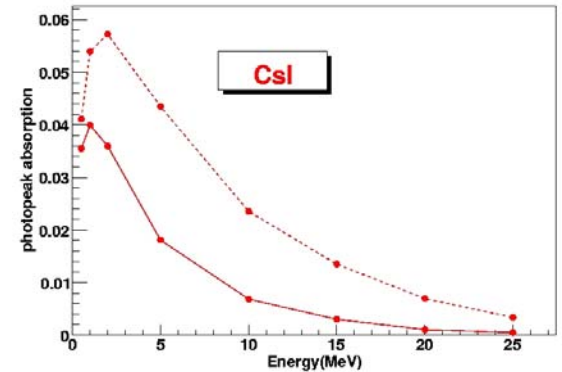


Fig. 21. 100000 events. Gamma spectrum in the 200 LaBr₃s / 5 MeV event.

200 phoswiches / G4 simulations Fold

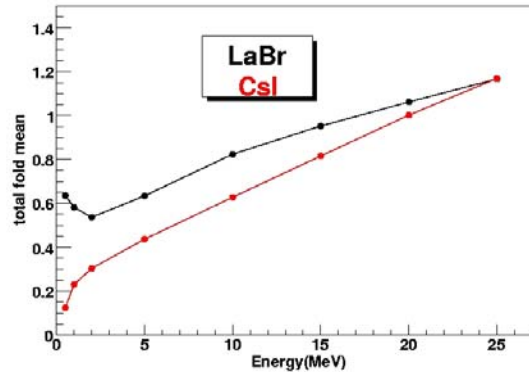
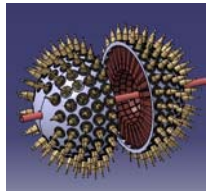


Fig. 17. Mean fold for events of multiplicity 1.

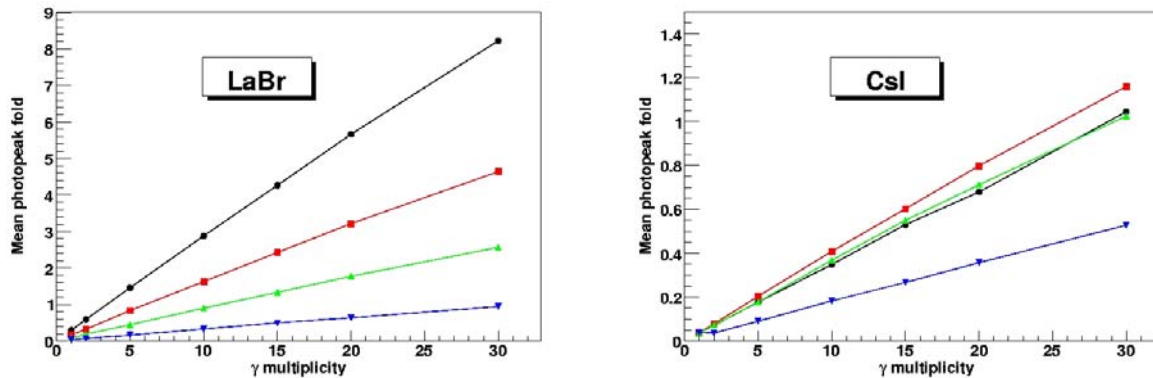


Fig. 18. : Mean fold (photopeak) in the LaBr and CsI
0.5 MeV (black), 1 MeV (red), 2 MeV (green) and 5 MeV (blue).

200 phoswiches / G4 simulations Fold

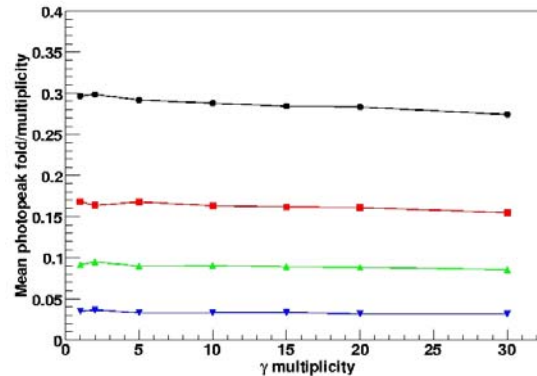
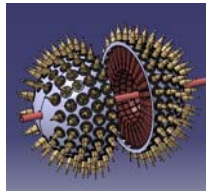


Fig. 19. : Mean photopeak fold / multiplicity in LaBr₃
0.5 MeV (black), 1 MeV (red), 2 MeV (green) and 5 MeV (blue).

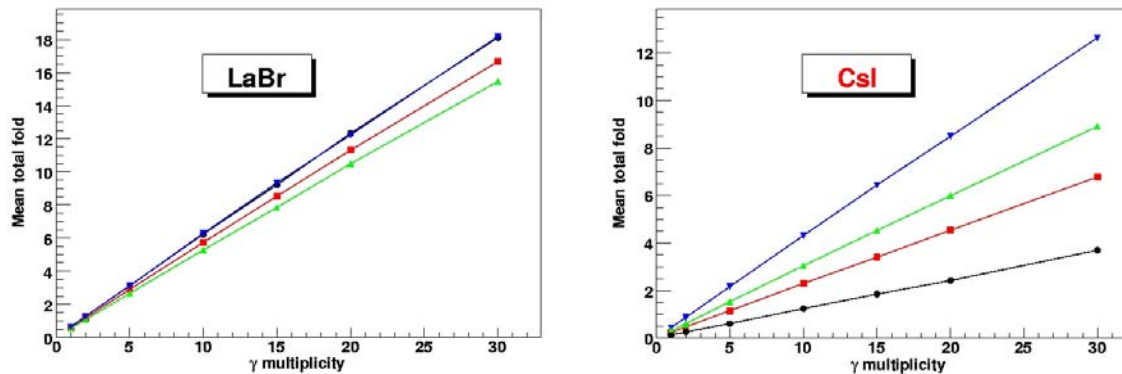
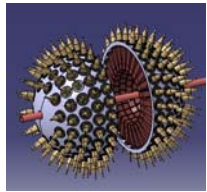


Fig. 20. : Mean fold in LaBr₃ and CsI
0.5 MeV (black), 1 MeV (red), 2 MeV (green) and 5 MeV (blue).

200 phoswiches / G4 simulations Angular distributions



0.5 MeV γ -rays

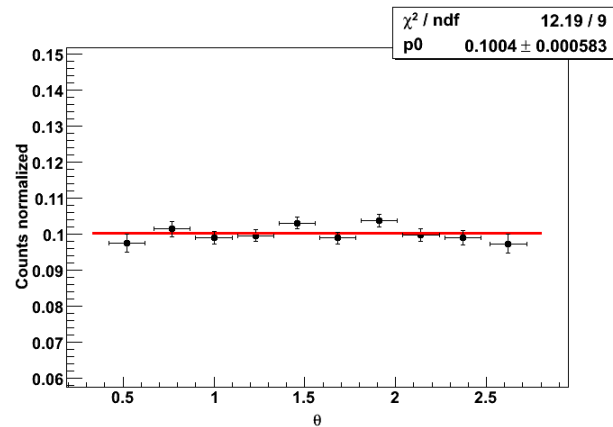


Fig. 26. : 100000 events.
Response to a uniform distribution

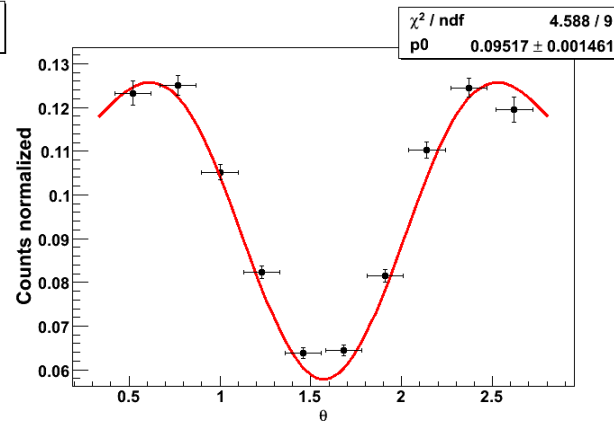


Fig. 27. : 100000 events.
Response to $4^+ \rightarrow 2^+$ transitions

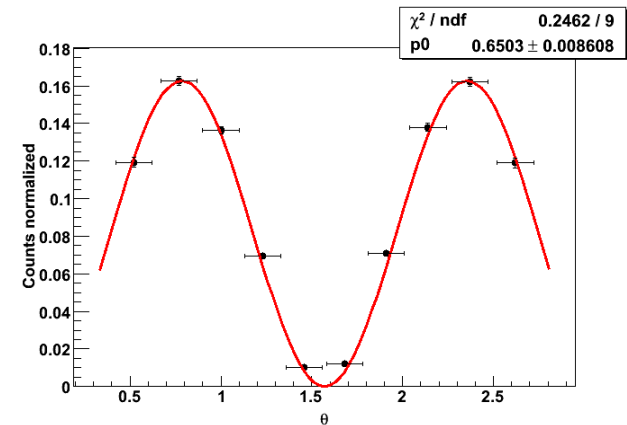


Fig. 28. : 100000 events.
Response to $2^+ \rightarrow 0^+$ transitions

Next ?

- Support of the 200 modules array / other solutions ?
- Simulations : add back / specific physics case (radiative capture – cascade decays)
other geometries ?
- Our discussion here ...

