Cube vs. AGATA geometry

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I. Quick comparison between AGATA A1800 geometry(Fig. 1), in which Ge material was changed to $LaBr_3$, and cubic geometry (Fig. 2).

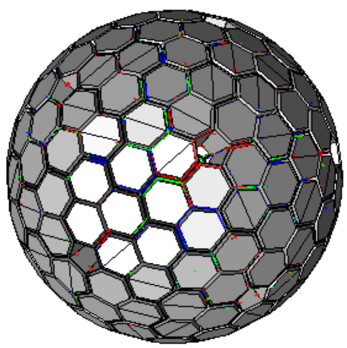

Figure 1. The 180 geometry of AGATA. The geometry is based on tiling a sphere with 180 hexagons and 12 pentagons.

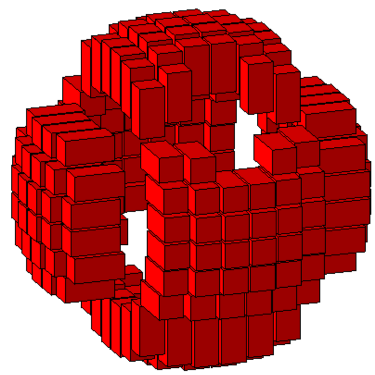

Figure 2. Geometry constructed with 200 2"x2"x4" $LaBr_3$ crystals.

In Figure 3 and 4 there is presented difference between full absorption gamma-rays efficiency in that two geometries. The relative difference (Fig. 4) which is calculated from equation:

$$R=\frac{Eff_{A180}-Eff_C}{Eff_{A180}}\cdot 100$$

where: Eff_{A180} is efficiency of AGATA 180 geometry; Eff_C is efficiency of cubic geometry; reach maximum value of 22% in range from 3 to 15 MeV.

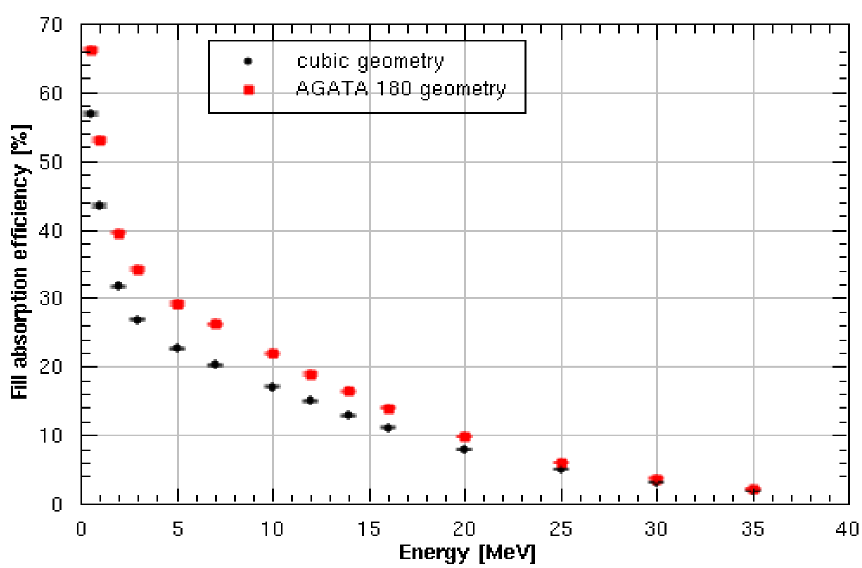

Figure 3. Full absorption of gamma-rays efficiency for cubic and AGATA 180 geometry.

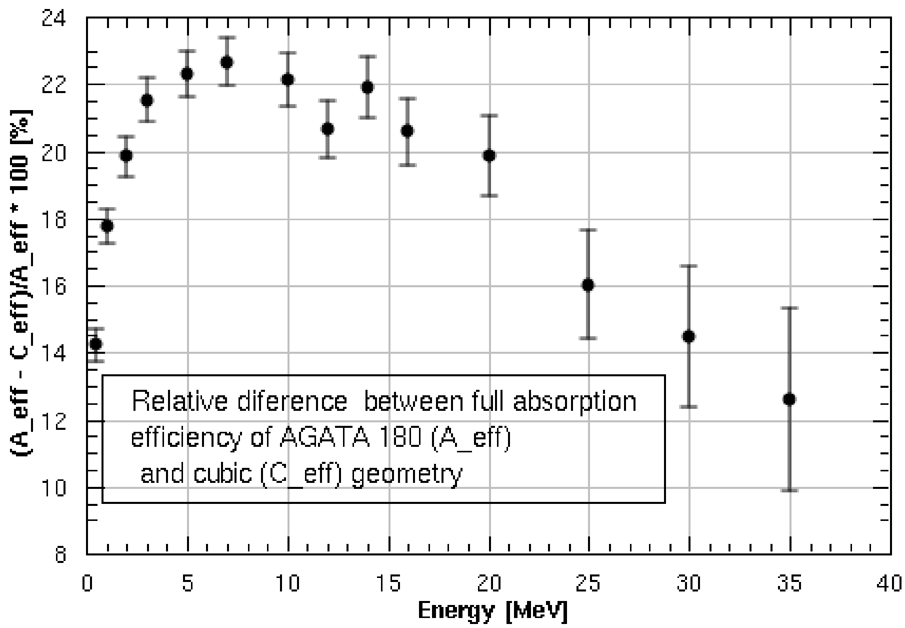

Figure 4. Relative difference between full absorption of gamma-rays efficiency for AGATA 180 and cubic geometry.

II. Dependency between emission angle of gamma rays and efficiency of cubic geometry.

Simulations were done with 200 $LaBr_3$ 2”x2”x4” cubic geometry. Gamma-rays were emitted into Θ range:
5.56 – 5.58 degree (figure 5) “case 1”,
16.72 – 16.74 degree (figure 6) “case 2”,
28.56 – 28.58 degree (figure 7) “case 3”,

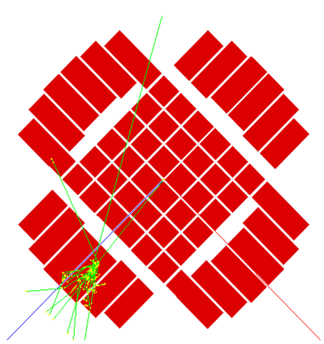

Figure 5. Emission into Θ 5.56 – 5.58 degree.

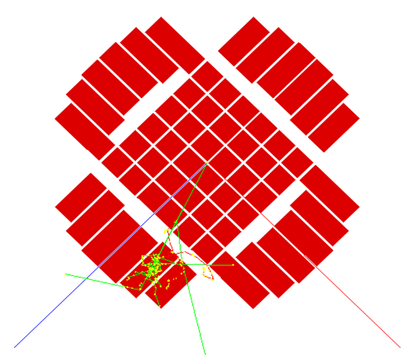

Figure 6. Emission into Θ 16.72 – 16.74 degree.

φ was set respectively to: 5.57 – 5.58 degree.
Value of Θ Θ and φ in each case is set to point center of the crystal. The same simulation was done with AGATA180 geometry , and because of spherical symmetry efficiency was the same each time shooting into the center of crystal.

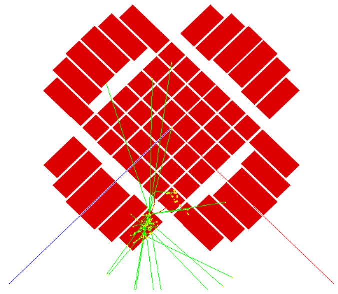

Figure 7. Emission into Θ   28.56 – 28.58 degree.

In cubic geometry there is visible change between efficiency of detector placed in the center of detector wall and one placed on the edge (figure 8).

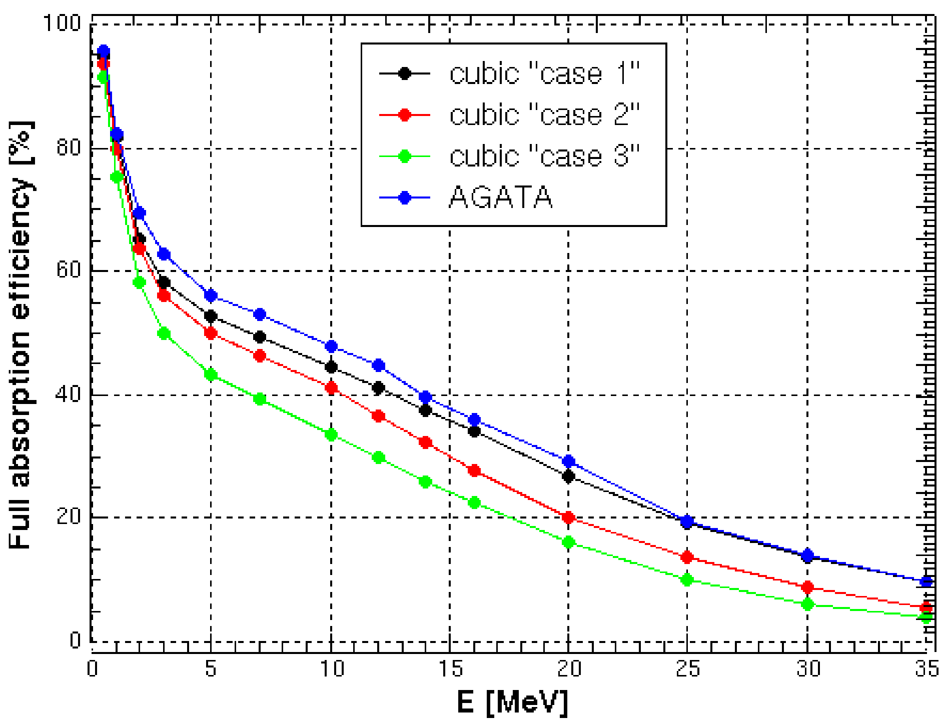

Figure 8. Full absorption efficiency of cubic and AGATA180 geometry for gamma-rays emitted into various angles.