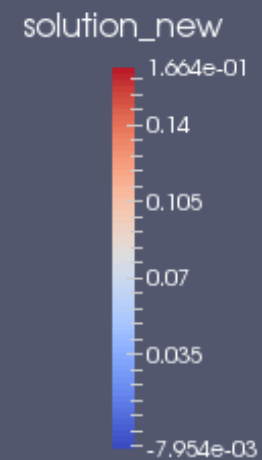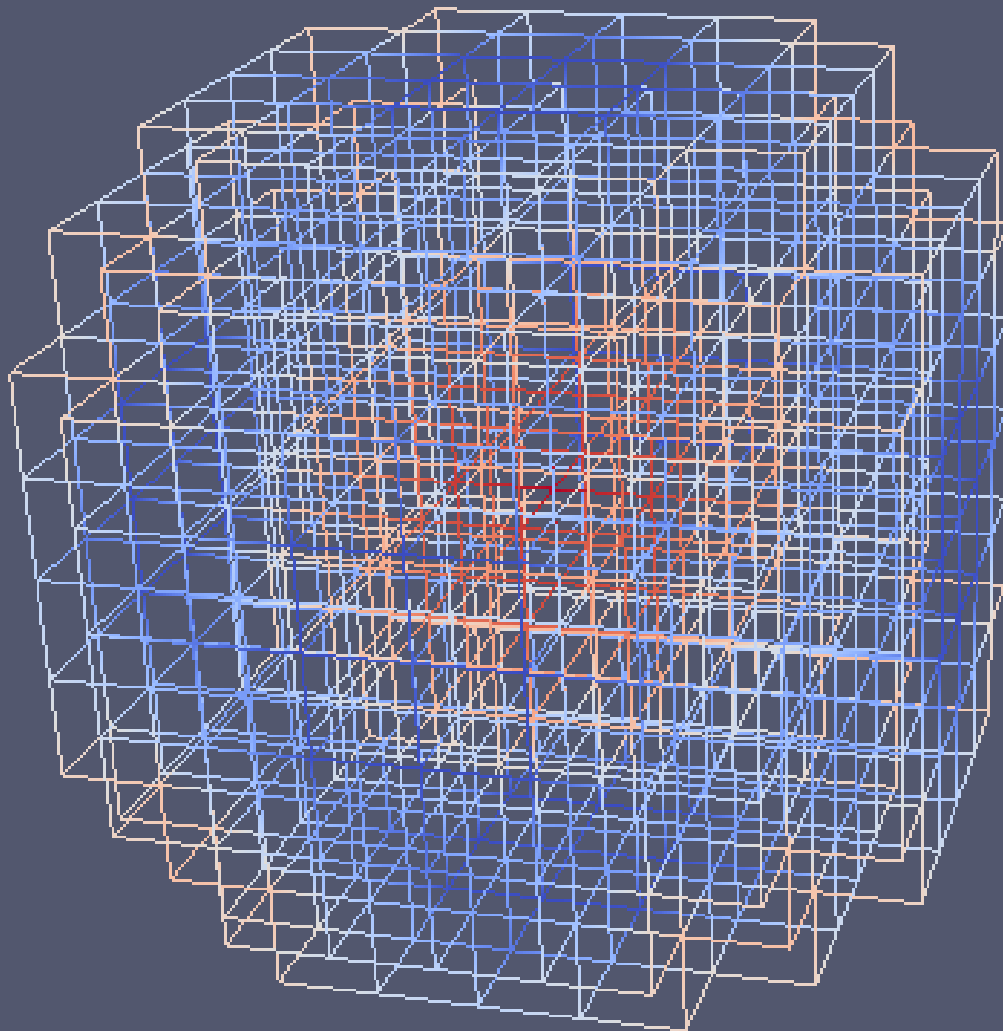Preliminary results for the Poisson problem in a sphere with radius r = 1.0 embedded in a uniform Cartesian grid [-2,2] x [-2,2]

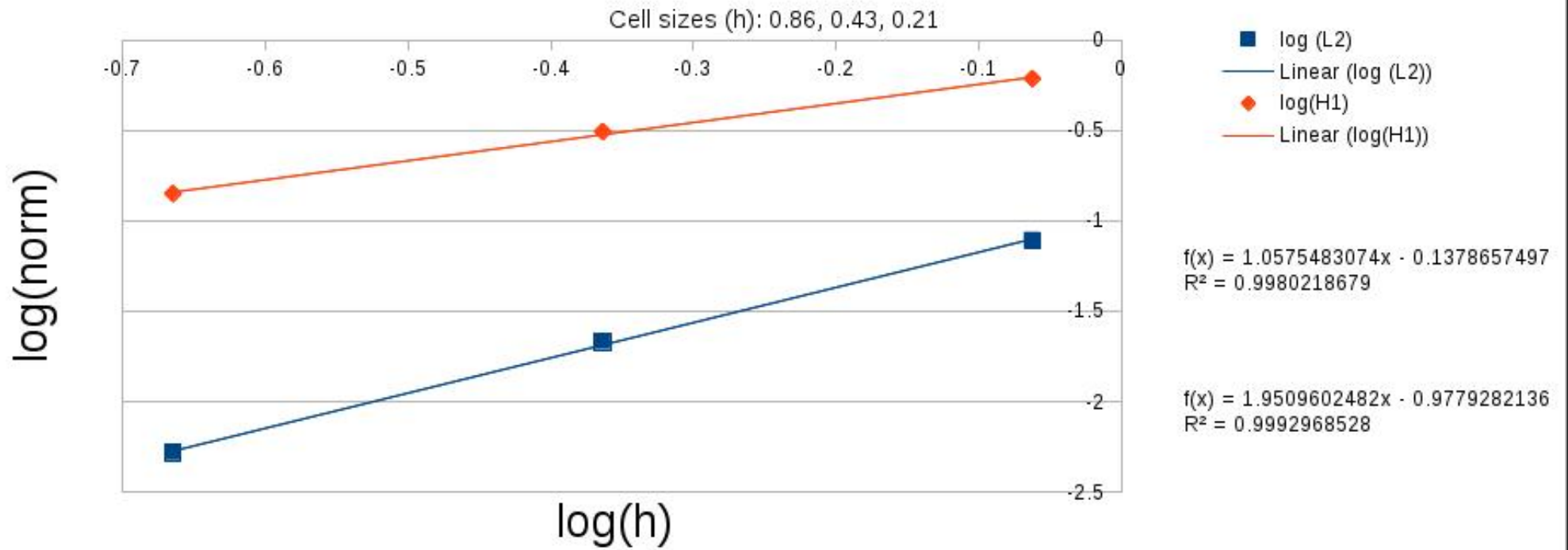$$-\Delta u = 1 \ \text{ in } \ \Omega$$

$$u = 0 \ \text{ on } \ \Gamma$$

FEM formulation based on the stabilized Nitsche's method (see Burman and Hansbo (2012), http://www.sciencedirect.com/science/article/pii/S0168927411000298).
By Afonso Alborghetti Londero, August 2015.

Solution for the Poisson problem, RHS f = 1 and Dirichlet B.C., g = 0 on r = 1. Solution shown for 4th refinement (out of 5)

solution_new

- 1.664e-01
- 0.14
- 0.105
- 0.07
- 0.035
- -7.954e-03

H1 and L2 norms

Cell sizes (h): 0.86, 0.43, 0.21

log(norm)

log(h)

log (L2)
Linear (log (L2))
log(H1)
Linear (log(H1))

$f(x) = 1.0575483074x - 0.1378657497$
$R^2 = 0.9980218679$
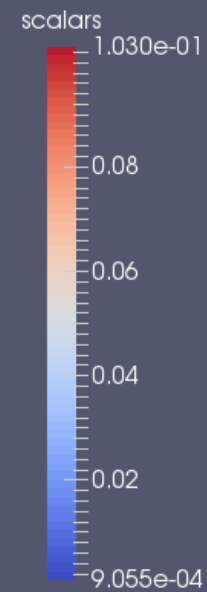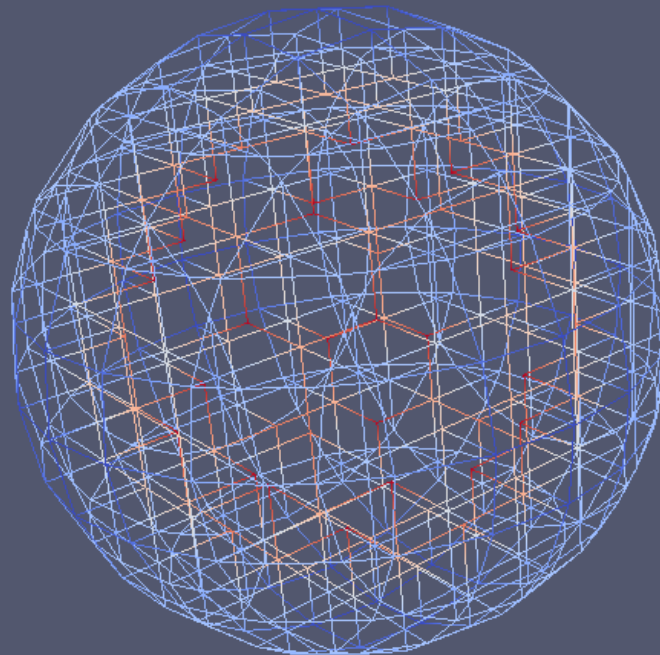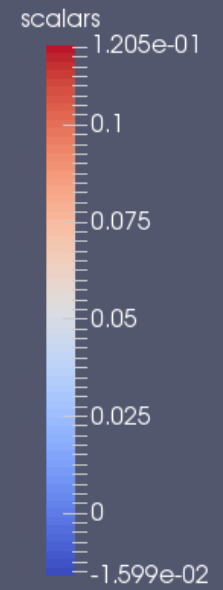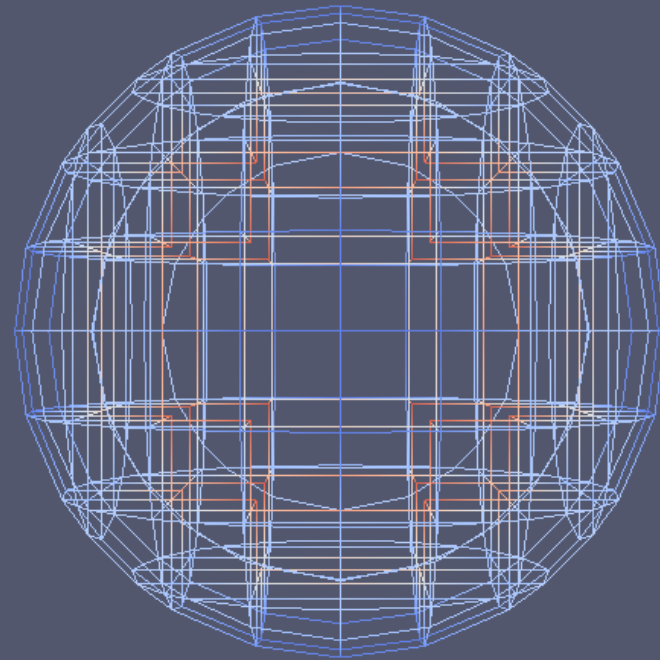
$f(x) = 1.9509602482x - 0.9779282136$
$R^2 = 0.9992968528$

Slice of the solution taken at the middle (X = 0). The black line represents the zero level set contour, and the white line the zero contour of the solution.
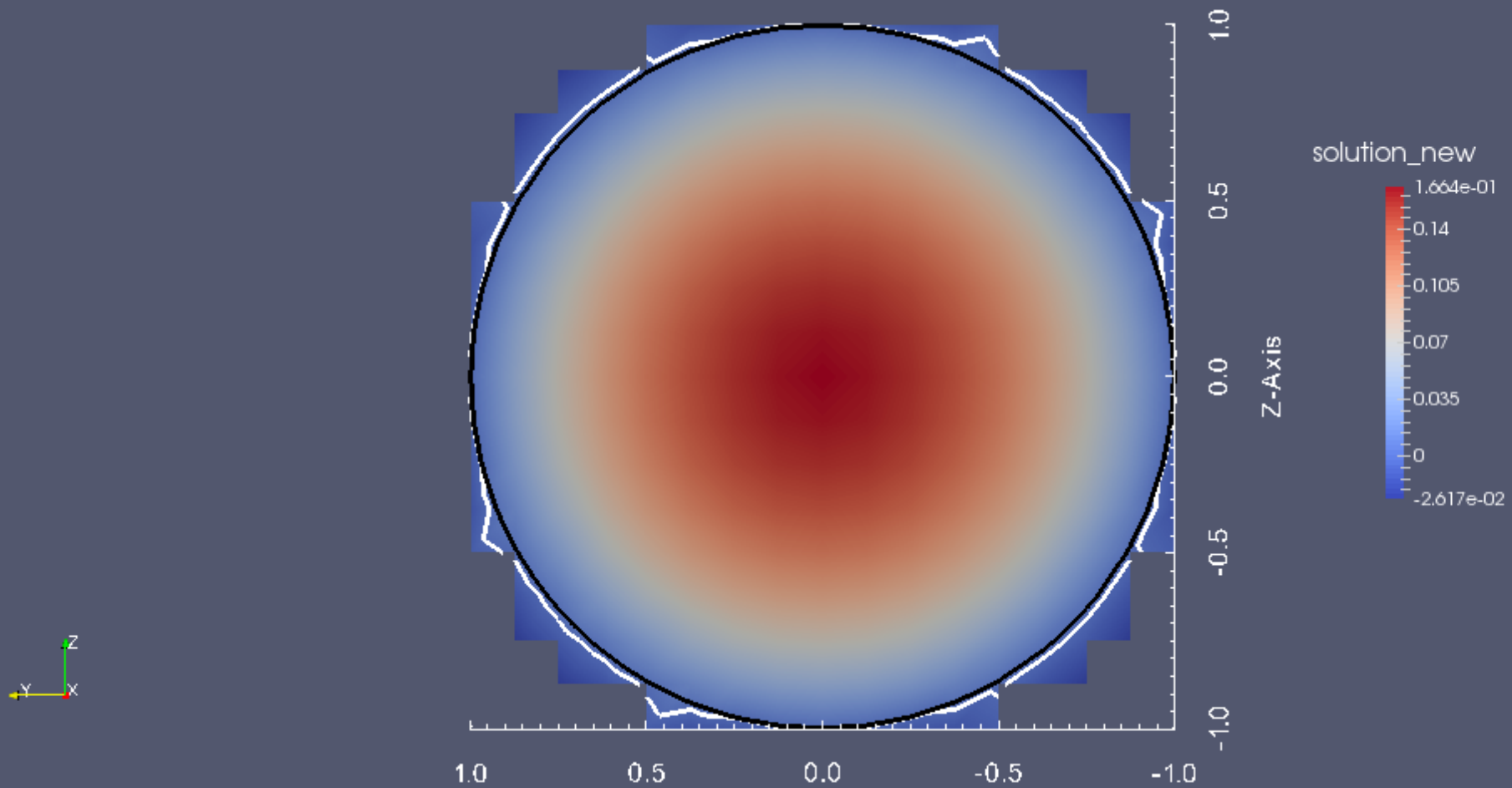
3rd Refinement,
Cut-cell mesh
h = 0.86
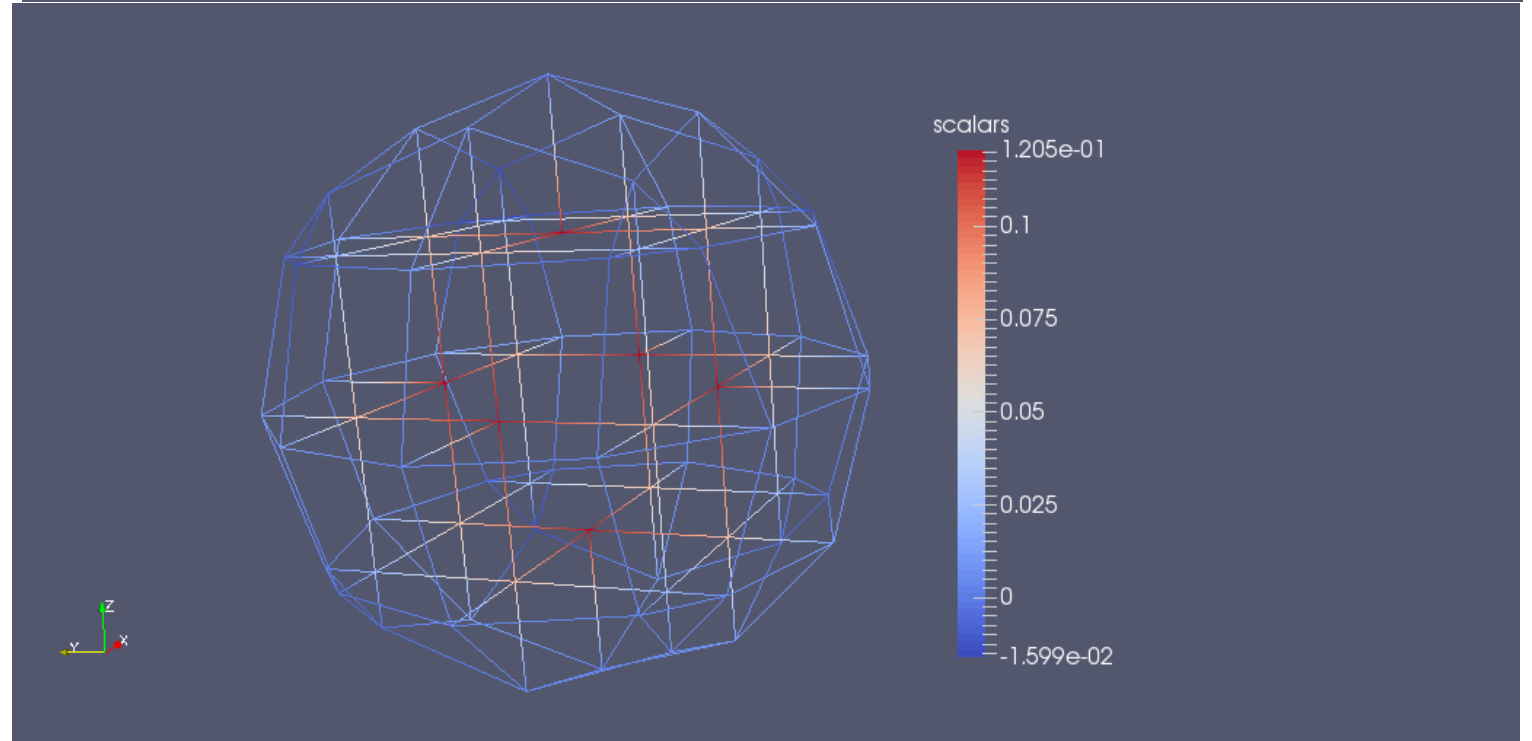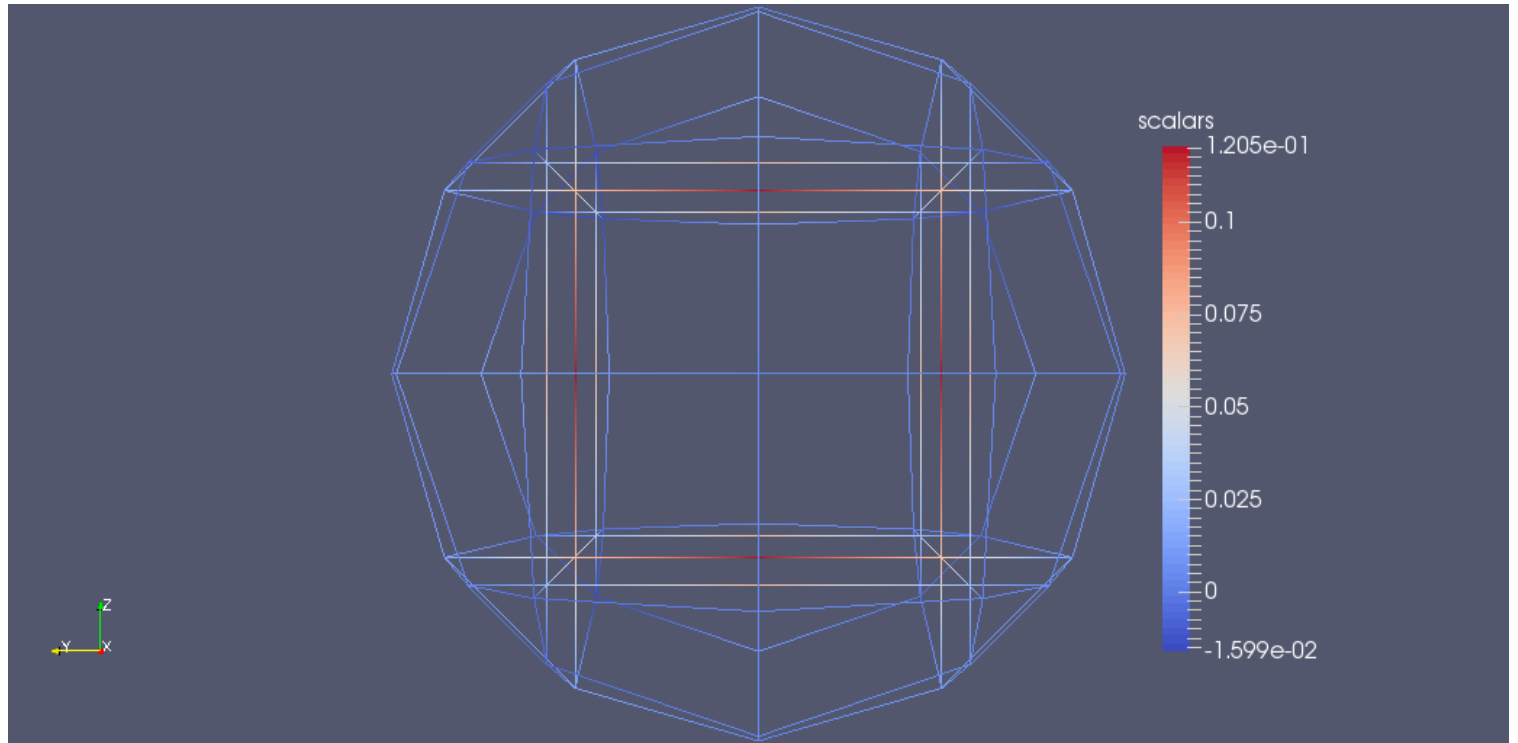
4th Refinement,
h = 0.43
Cut-cell mesh

5th Refinement,
h = 0.22
Cut-cell mesh

5th Refinement,
h = 0.22
Cut-cell mesh