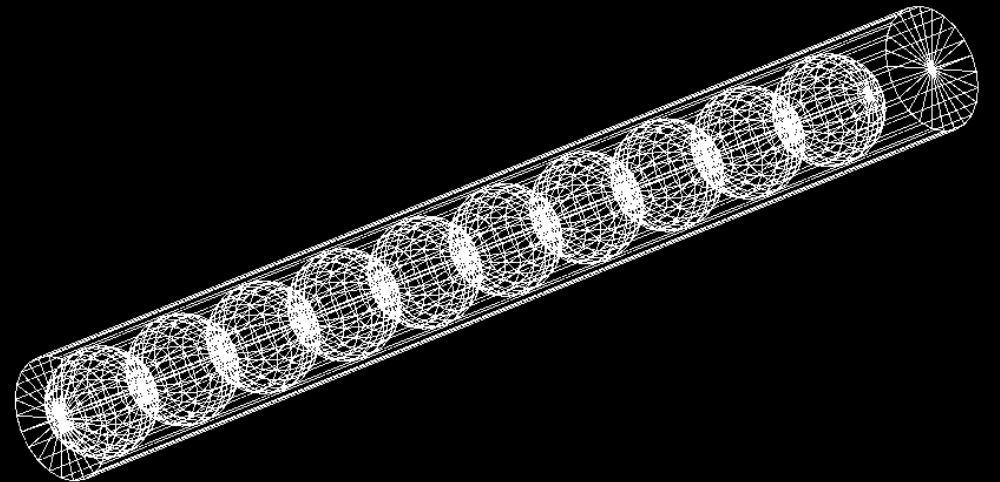


STUDY OF SPHERICAL TARGET FOR LBNE

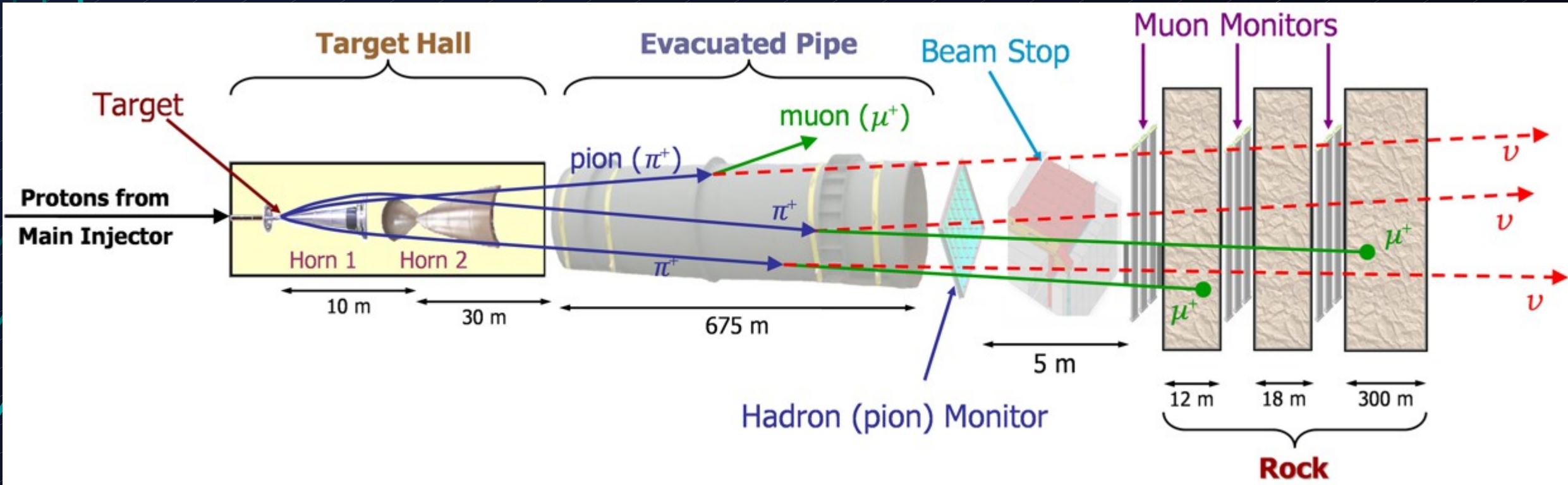
QUYNH NGUYEN, SUMMER INTERN 2014

Goal:

- Build geometry using GEANT4 (completed)
- To run Monte Carlo simulation of spherical array target made of Beryllium
- Calculate neutrino flux
- Calculate variation of flux as a function of beam position

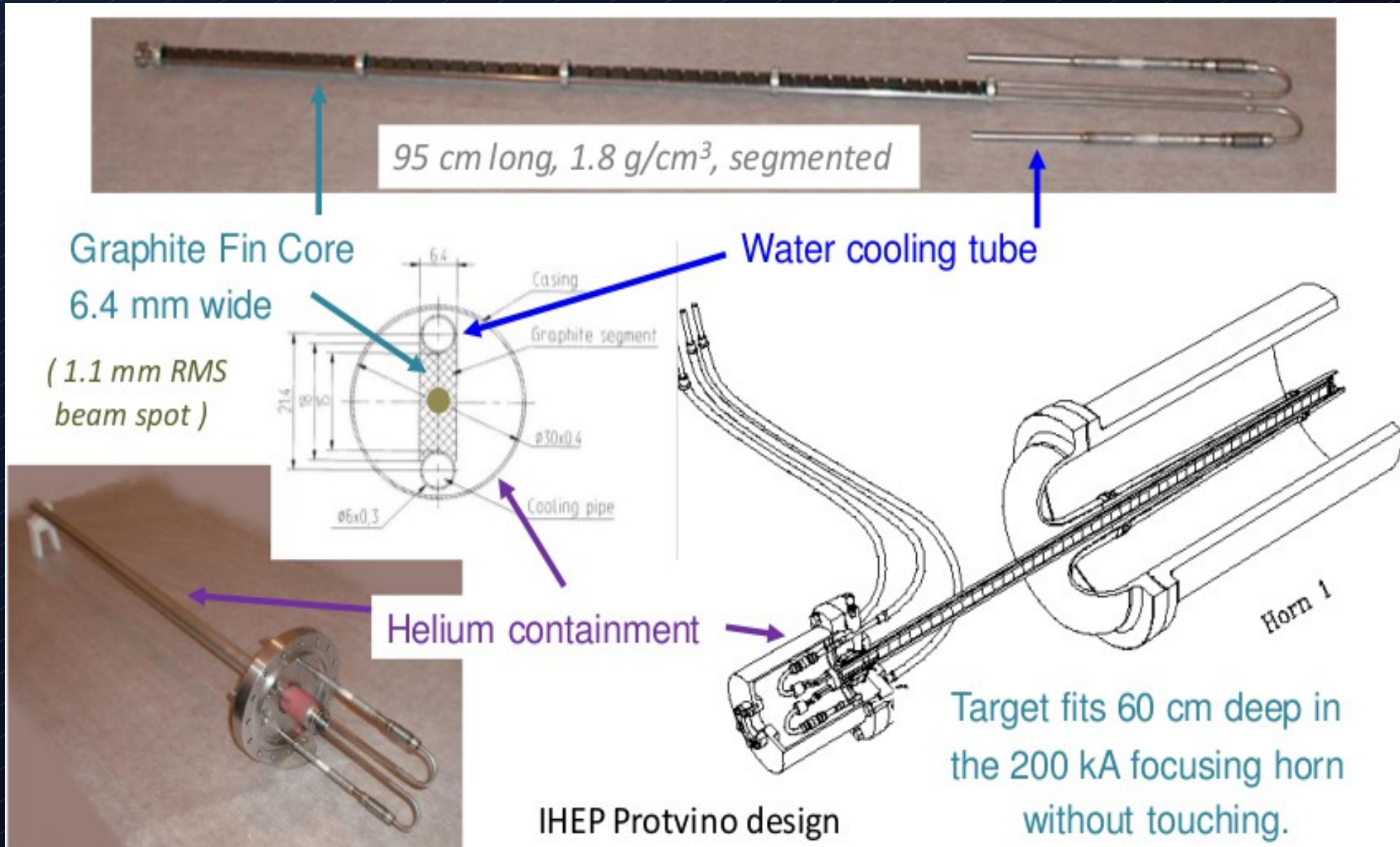


BEAM LINE



MINOS beam line. arXiv:1307.0721 [hep-ex] FERMILAB-PUB-13-279-PPD

NuMi Target (from J. Hysten)



CALCULATING TARGET DIMENSION

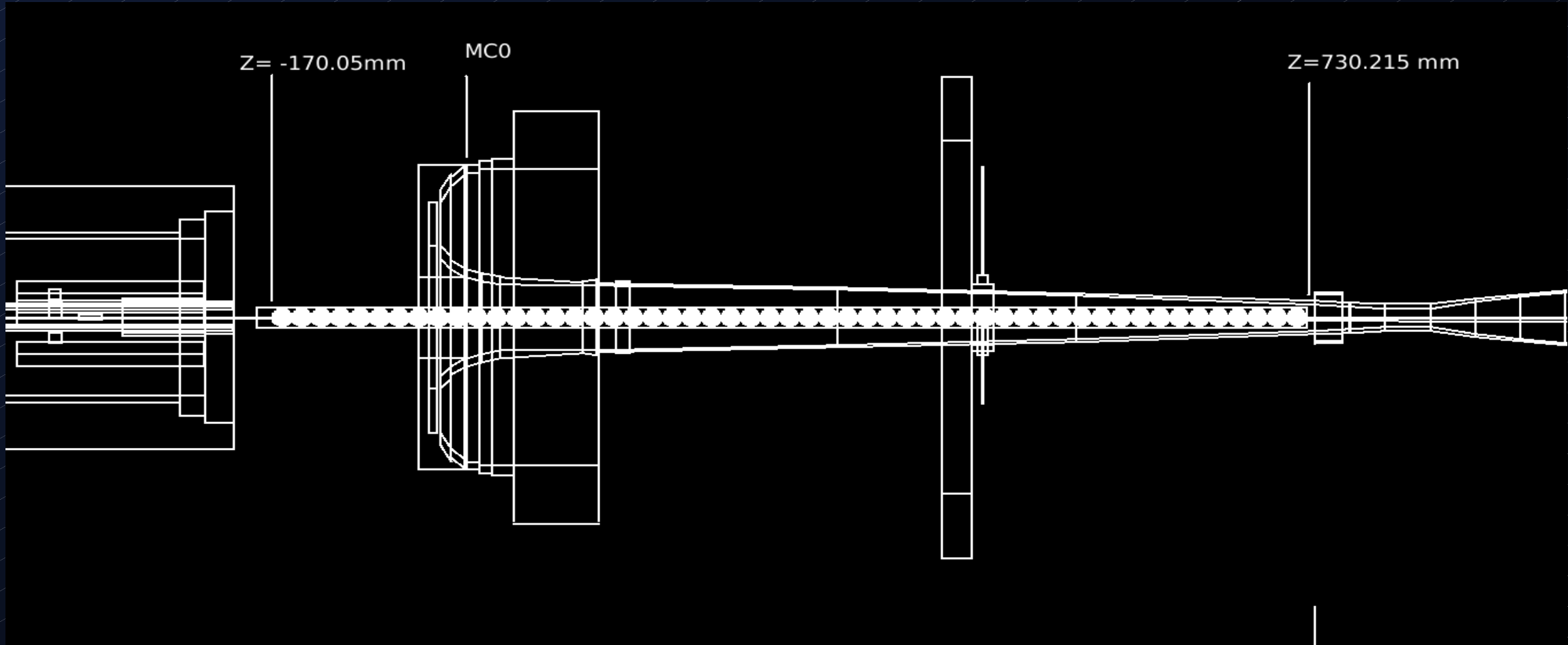
- Calculate effective interaction length as a function of beam position, weighted by Gaussian distribution of the beam (with $\sigma = R/3$)
- Two interaction lengths equivalence for Beryllium:

$$\int_{-R}^R \left(\frac{1}{\sqrt{2\pi\sigma}} e^{-\frac{r^2}{2\sigma^2}} \right) \times 2N \sqrt{R^2 - r^2} dr = 84.2 \text{ cm}$$

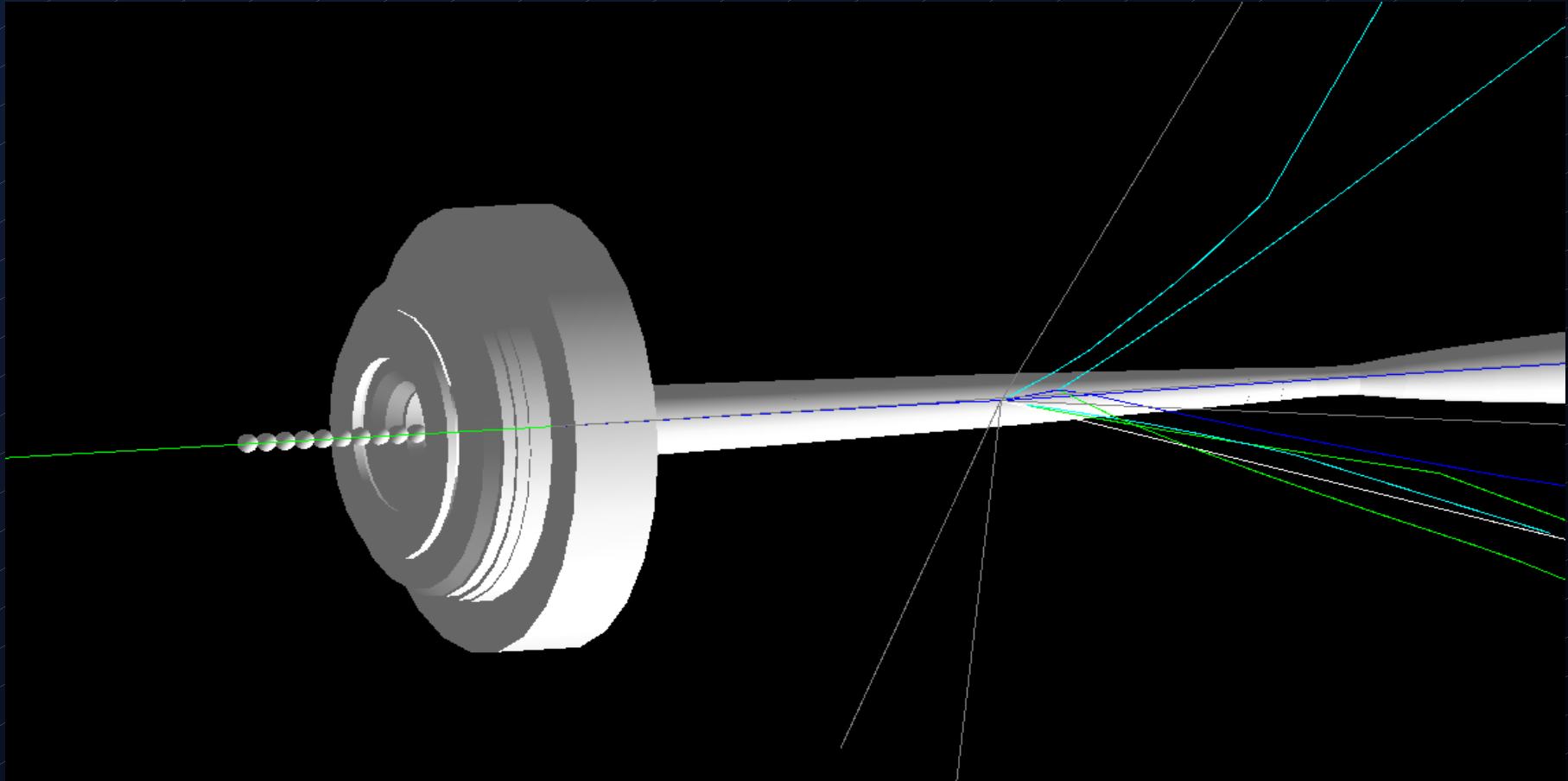
Number of spheres: $N = 53$ of $\Phi 17\text{mm}$

NEW TARGET TENTATIVE POSITION

- Using $\Phi 17\text{mm}$ sphere in $\Phi 20\text{mm}$ can, and 1.5 mm clearance from the horn, target outside horn 1 length can be reduce to 170mm (tentative)



Simulation of Target and Horn1 with 1 Proton on Target (POT)

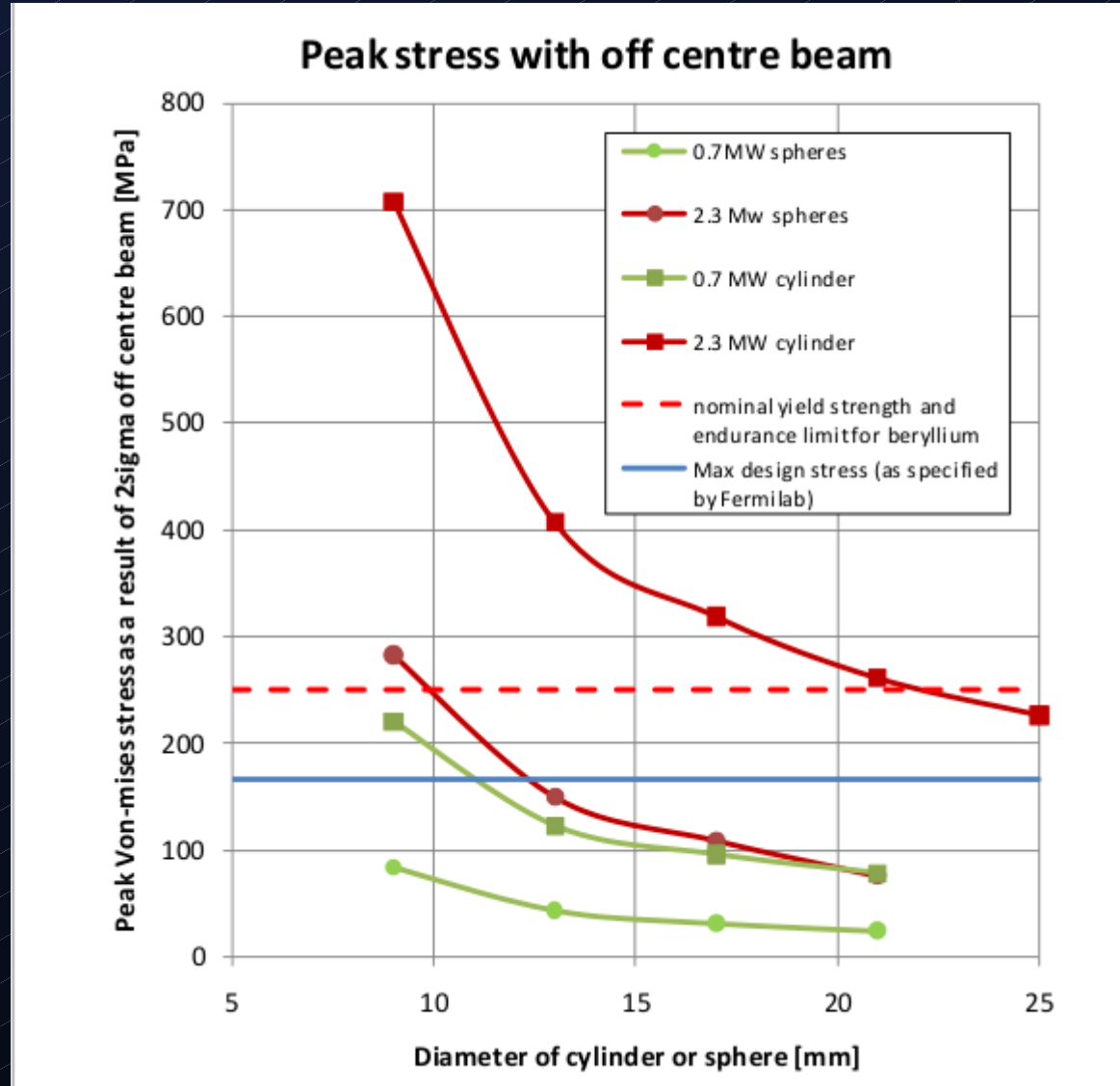


PLAN UNTIL AUG 8TH

- Submit job of 500 runs of 100,000 POT to the grid
- Compare neutrino flux with flux produced by graphite target
- Calculate variation of flux as a function of beam Position
- Make better graphics
- Present at LBNE collaboration meeting
- Write the report

Back up slides

Peak stress across Task A parameter space for a 2 sigma off centre beam (worst case design point)



Parameters:

- Material: Beryllium
- First try $\text{Ø}17\text{mm}$ and try to reduce further to $\sim \text{Ø}10\text{mm}$
- Target length: two “effective” interaction lengths
- Beam size 3σ ; beam power 1.2MW
- Try different material ?

