Multidimensional Optimization Plan

And Simulation News

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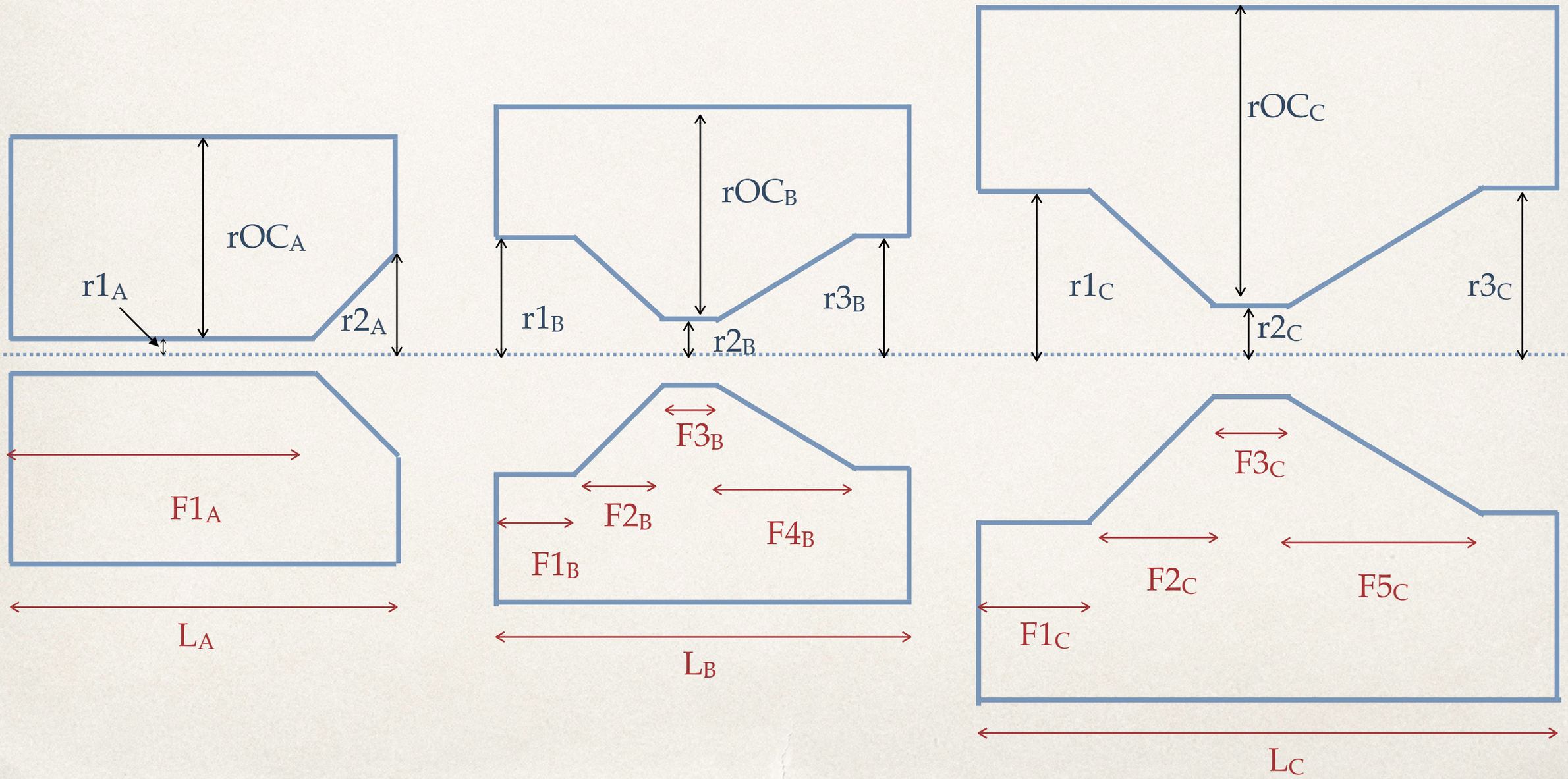
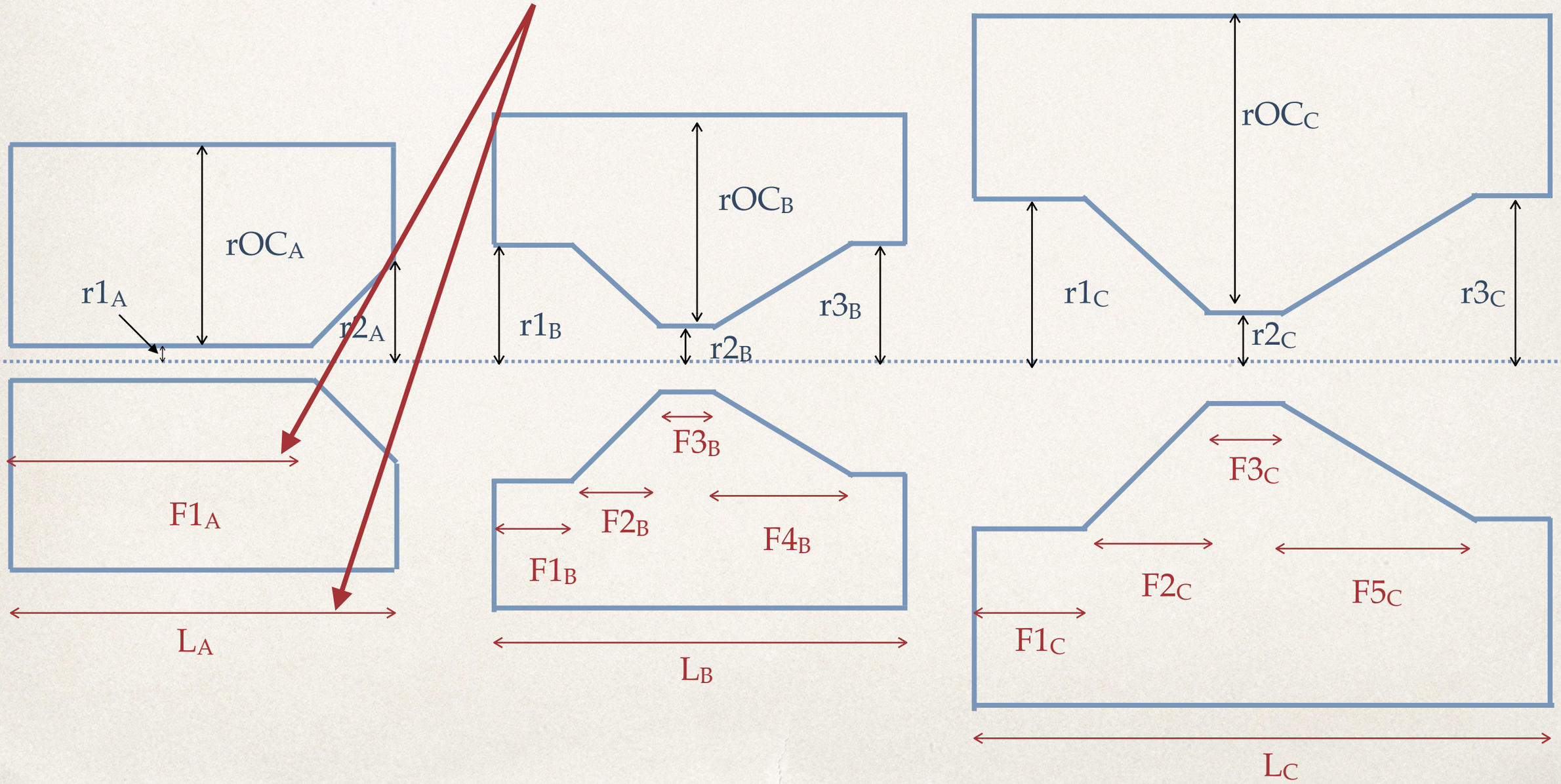
Optimization Plan

- I'm planning to start a new optimization this week
  - It will use three horns:



Optimization Plan

Horn lengths are defined sligtly differently than I've done in the past. I'm going to set one total horn length, then each segment's length will be a variable fraction of the total length. This will make it mechanically easier to study the dependence of results on total horn length (rather than individual segment length)



Optimization Plan

- Optimization metric
  - Will use same metric considered before:
    - 6 year 75% CP coverage estimated based on 2014 Fast MC
  - In parallel, will run simulations necessary to compute:
    - Updated 75% CP coverage estimated based on updated sensitivity calculation used for CDR
    - 75% CP coverage after a longer exposure (12 years?)
    - Minimum MH sensitivity
    - Error on delta CP:
      - Averaged over delta CP
      - At pi/2

Optimization Plan

Parameter	Lower Limit	Upper Limit	Unit
Horn A: L_A	2000	4500	mm
Horn A: $F1_A$	1	99	%
Horn A: $r1_A$	20	50	mm
Horn A: $r2_A$	20	200	mm
Horn A rOC_A	200	650	mm
Horn B: L_B	2000	4500	mm
Horn B: $F1_B$	1	96	%
Horn B: $F2_B$	1	96	%
Horn B: $F3_B$	1	96	%
Horn B: $F4_B$	1	96	%
Horn B: $R1_B$	20	200	mm
Horn B: $R2_B$	20	200	mm
Horn B: $R3_B$	20	200	mm
Horn B: ROC_B	200	650	mm
HornB: Z position	2000	17000	
Horn C: L_C	1000	4500	mm
Horn C: $F1_C$	1	96	%
Horn C: $F2_C$	1	96	%
Horn C: $F3_C$	1	96	%
Horn C: $F4_C$	1	96	%
Horn C: $R1_C$	20	200	mm
Horn C: $R2_C$	20	200	mm
Horn C: $R3_C$	20	200	mm
Horn C: ROC_C	200	650	mm
Horn C: Z Position	4000	19000	mm
Target Length	0.5	1.75	m
Beam spot size	1.6	2.5	mm
Target Fin Width	9	15	mm
Proton Energy	60	120	GeV
Horn Current	200	300	kA
Off-axis Angle	0	15	mrad

Parameters that will be varied and their constraints

- Other Constraints:
  - $F1_B + F2_B + F3_B + F4_B < 99\%$
  - $F1_C + F2_C + F3_C + F4_C < 99\%$
  - Horn B must start after Horn A ends; Horn C must start after Horn B ends
  - All horns must be contained within 21 m of MCZERO
  - Variable conductor thickness (see next slide)
- Will run three different optimizations
  - Graphite fin target
  - Beryllium fin target
  - Graphite cylindrical target

Optimization Plan

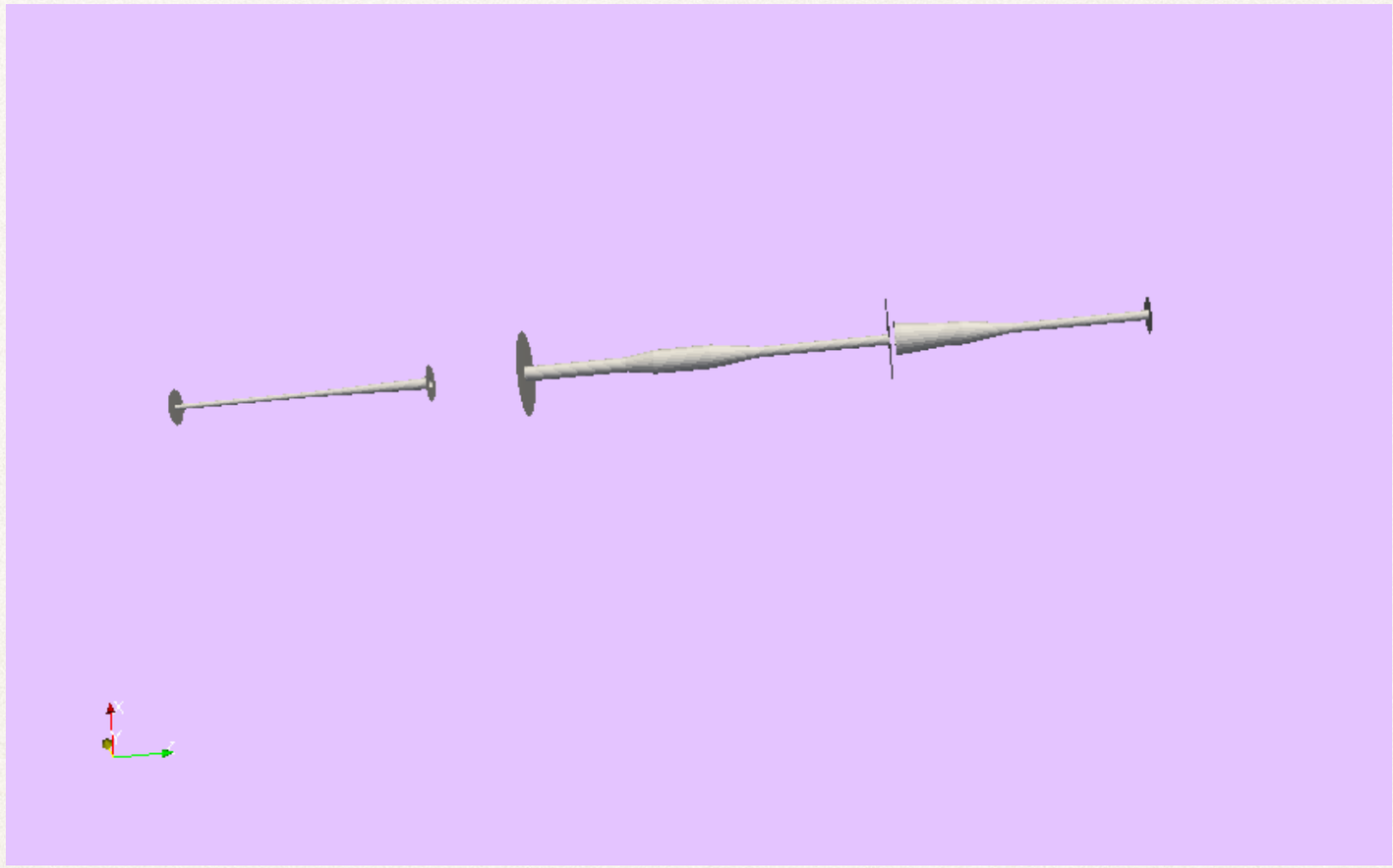
- Conductor thickness proportional to their radii
  - 2mm for 200 mm radii or less
  - Add 0.5 mm for ever 100 mm increase beyond that
  - One thickness for entire inner conductor determined by largest IC radius

Optimization Plan

- Optimization options to be studied separately from genetic algorithm
  - Targets with high-Z material in downstream region
  - Parabolic horn shape
  - Target position with respect to horn A
    - Requires realistic description of endcap material, not currently in simulation
  - Spherical array target option
  - Target fin spacing(?)
  - Split target option

Simulation News

- The three horn option works in G4LBNE!



- visualization of a randomly chosen three-horn configuration

Simulation News

- I tagged v3r3p9
  - Includes the 3(+) horn option
  - Nominal flux has not changed significantly since v3r3p8
- I also successfully ran a g4lbne job on the Open Science Grid (OSG)
  - Will increase the amount of CPU we have available
  - Not ready to become default yet — missing libraries prevent root jobs from running at some sites
  - But submit_flux.py has an —osg option
  - Thanks to Ken Herner for his help with this

The End