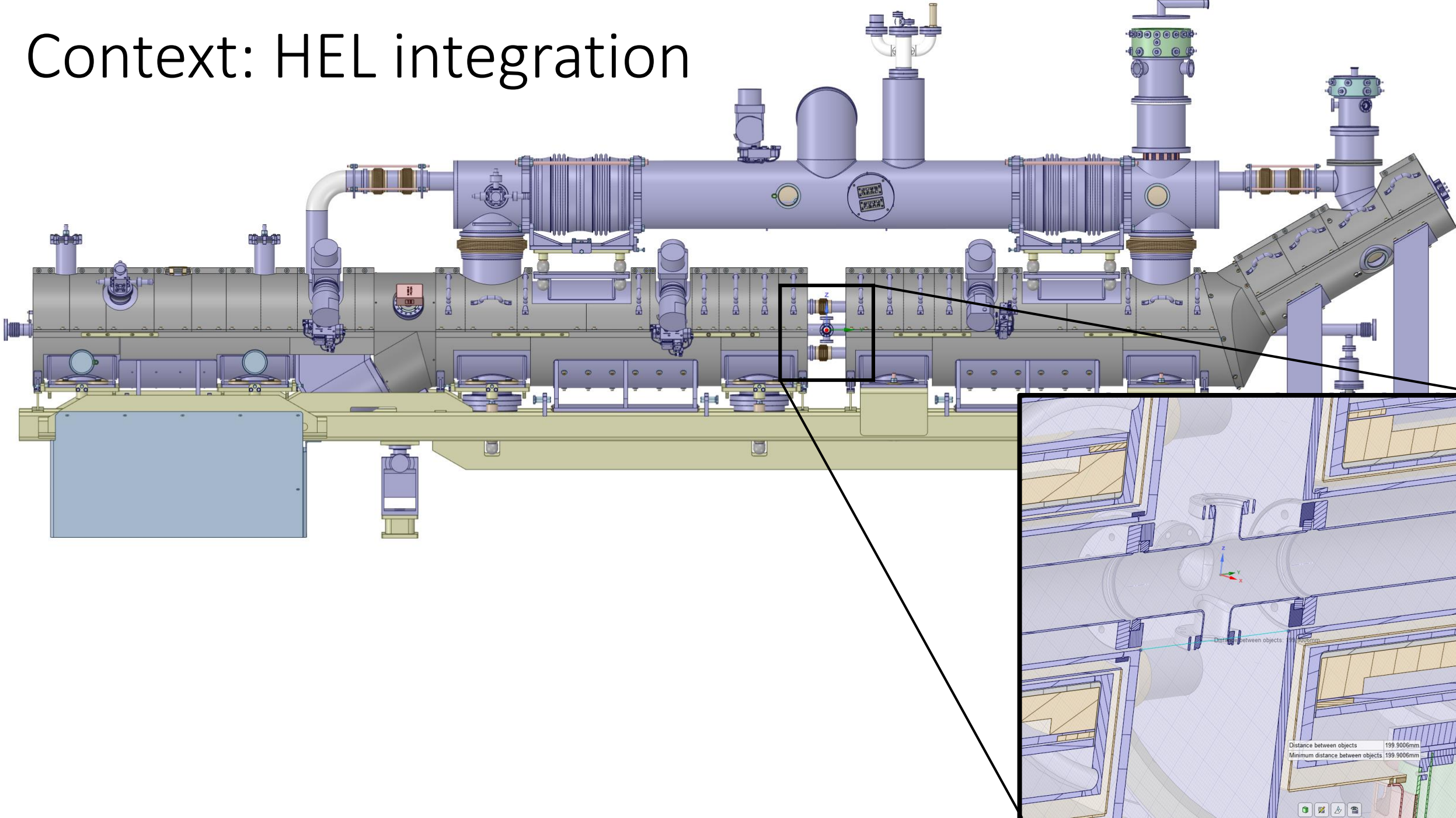


Ver.4 (HEL) instrument vacuum preview

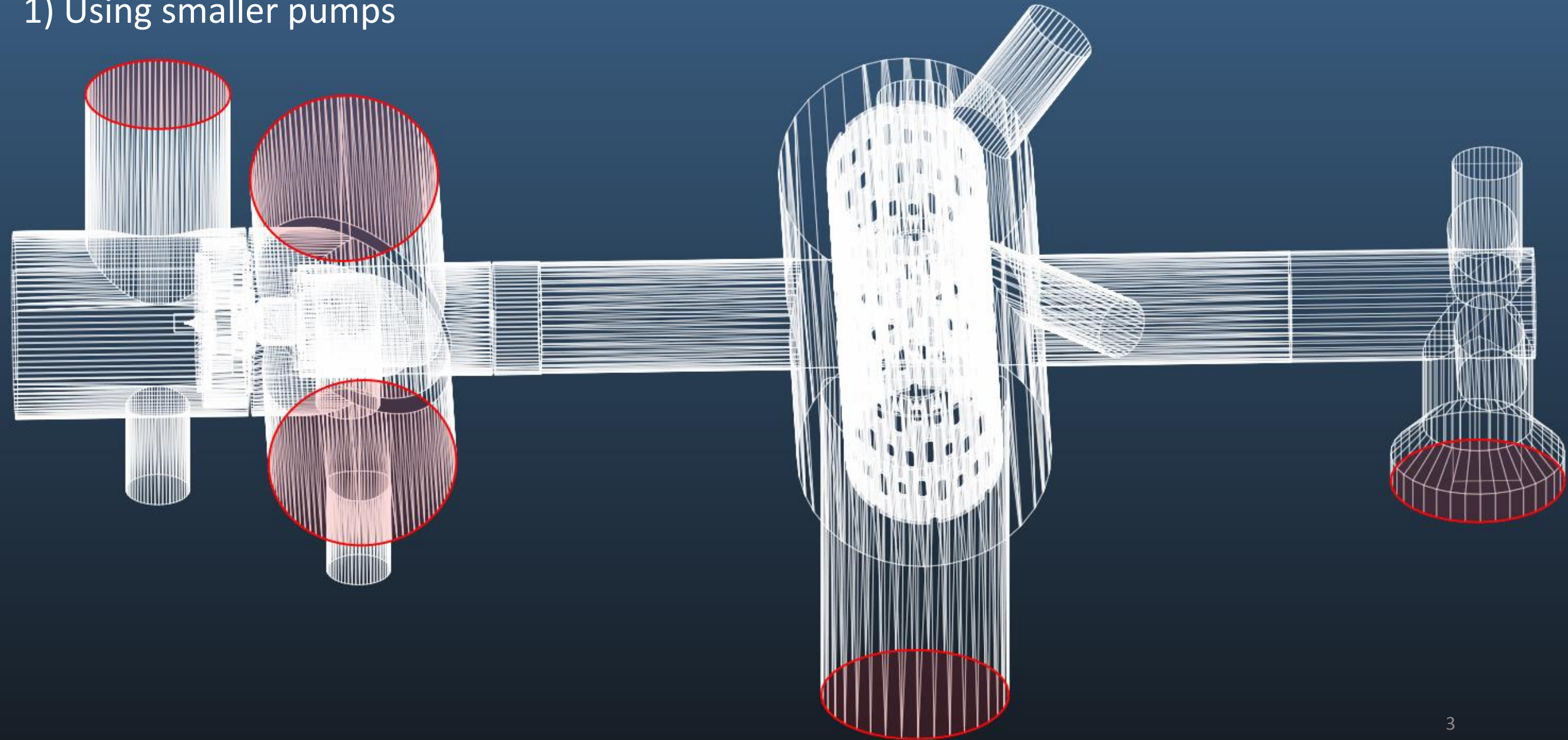
Marton Ady

BGC Collaboration meeting, 10.12.2020

Context: HEL integration

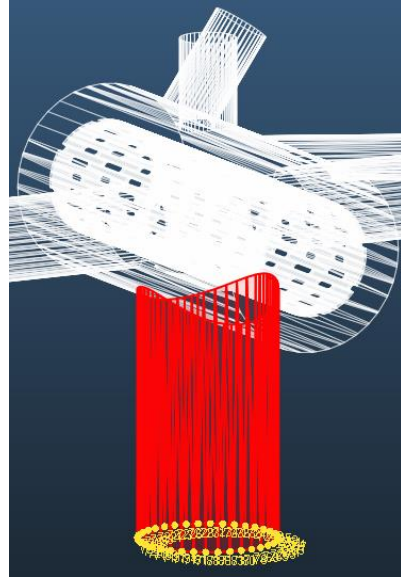


1) Using smaller pumps

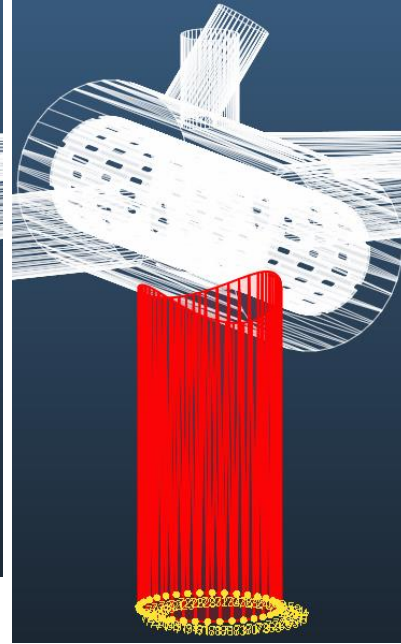


Effects of a more compact system (see <https://indico.cern.ch/event/963280/>)

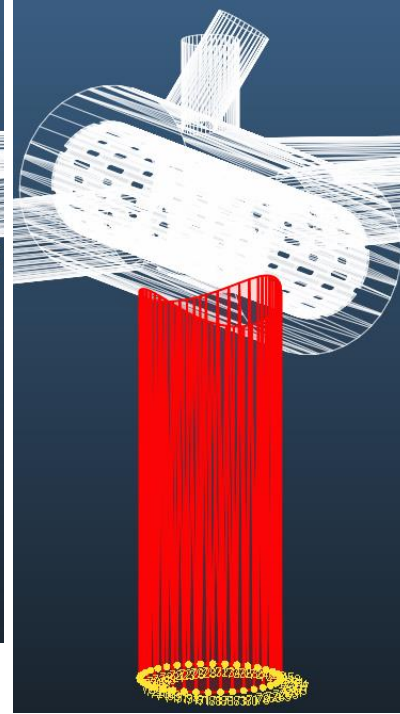
2) Pumps farther away



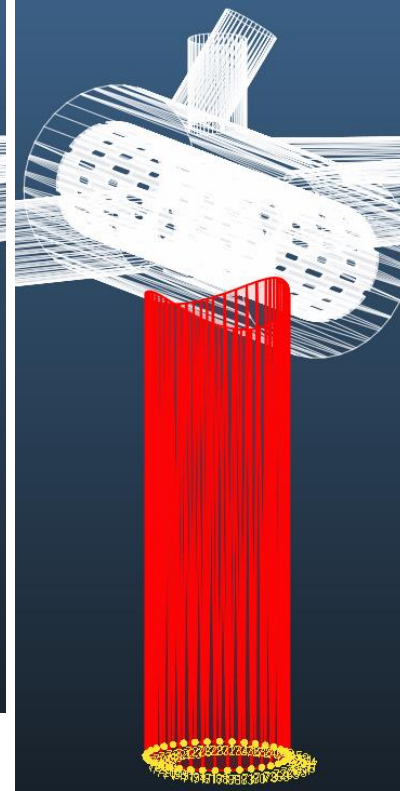
Baseline: 17cm



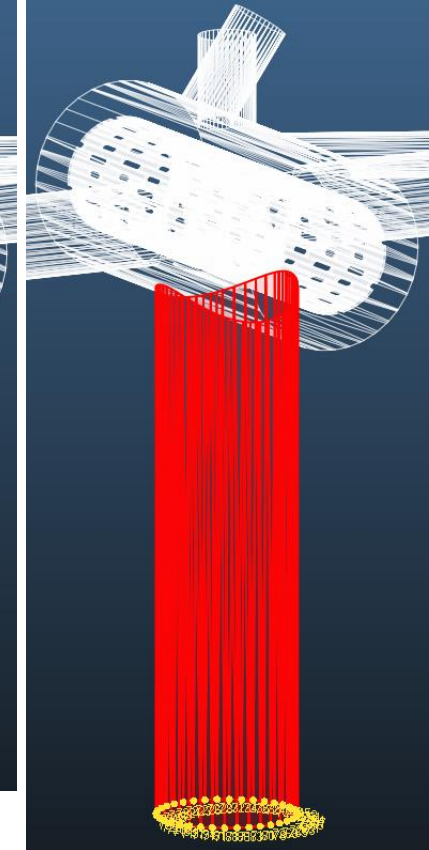
22cm



27cm

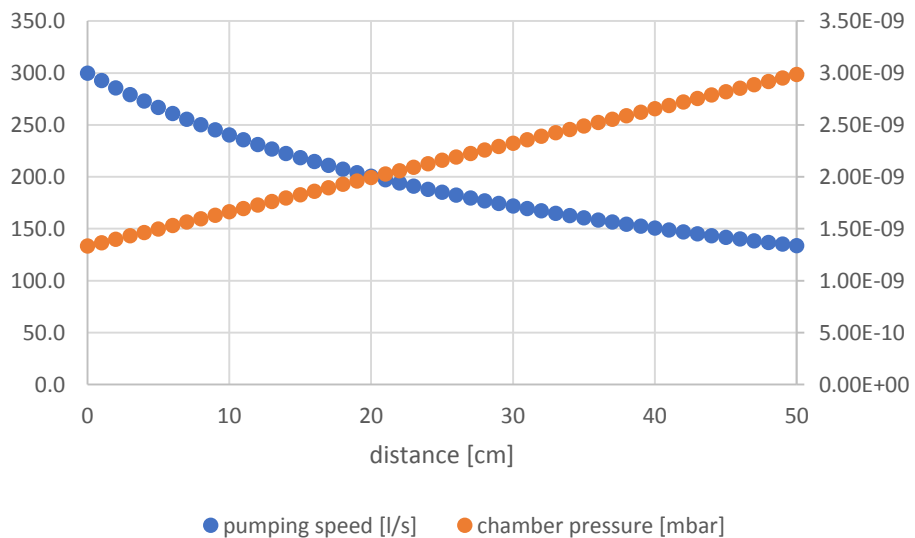


32cm



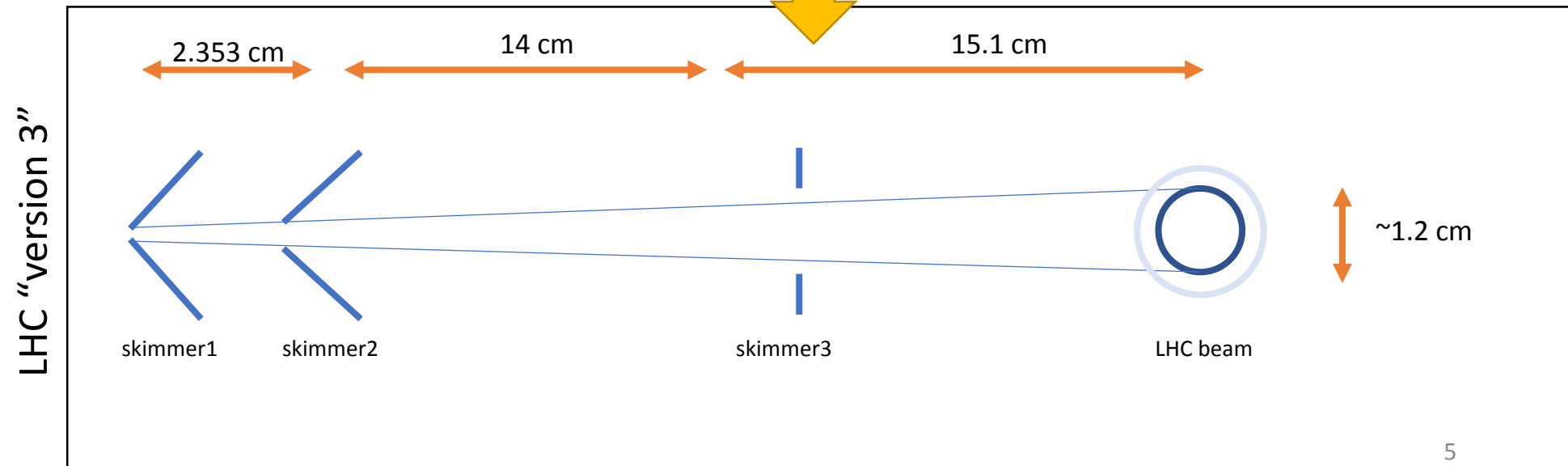
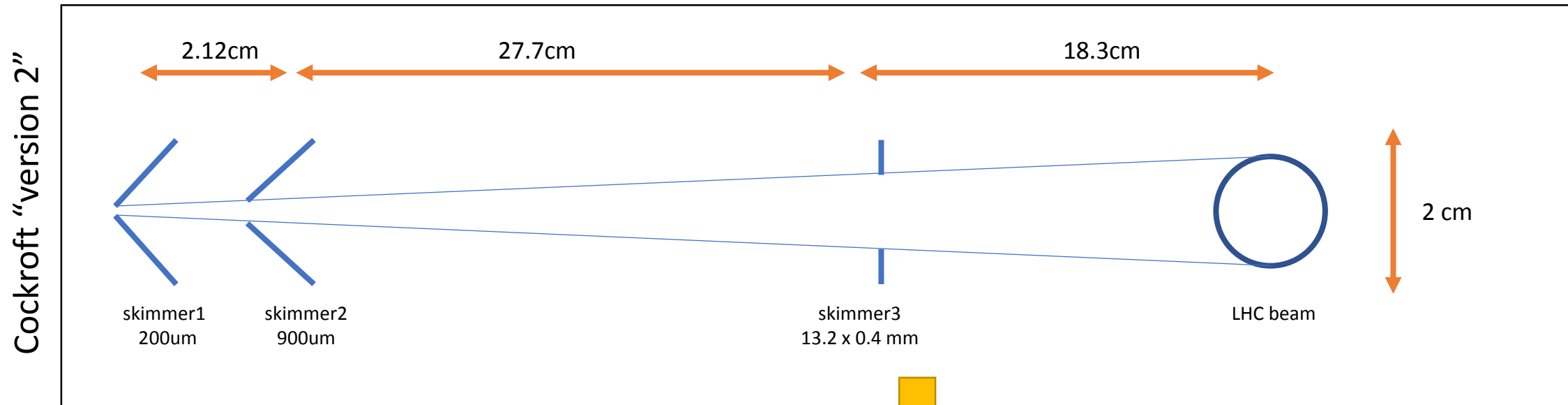
37cm

Pump-chamber distance

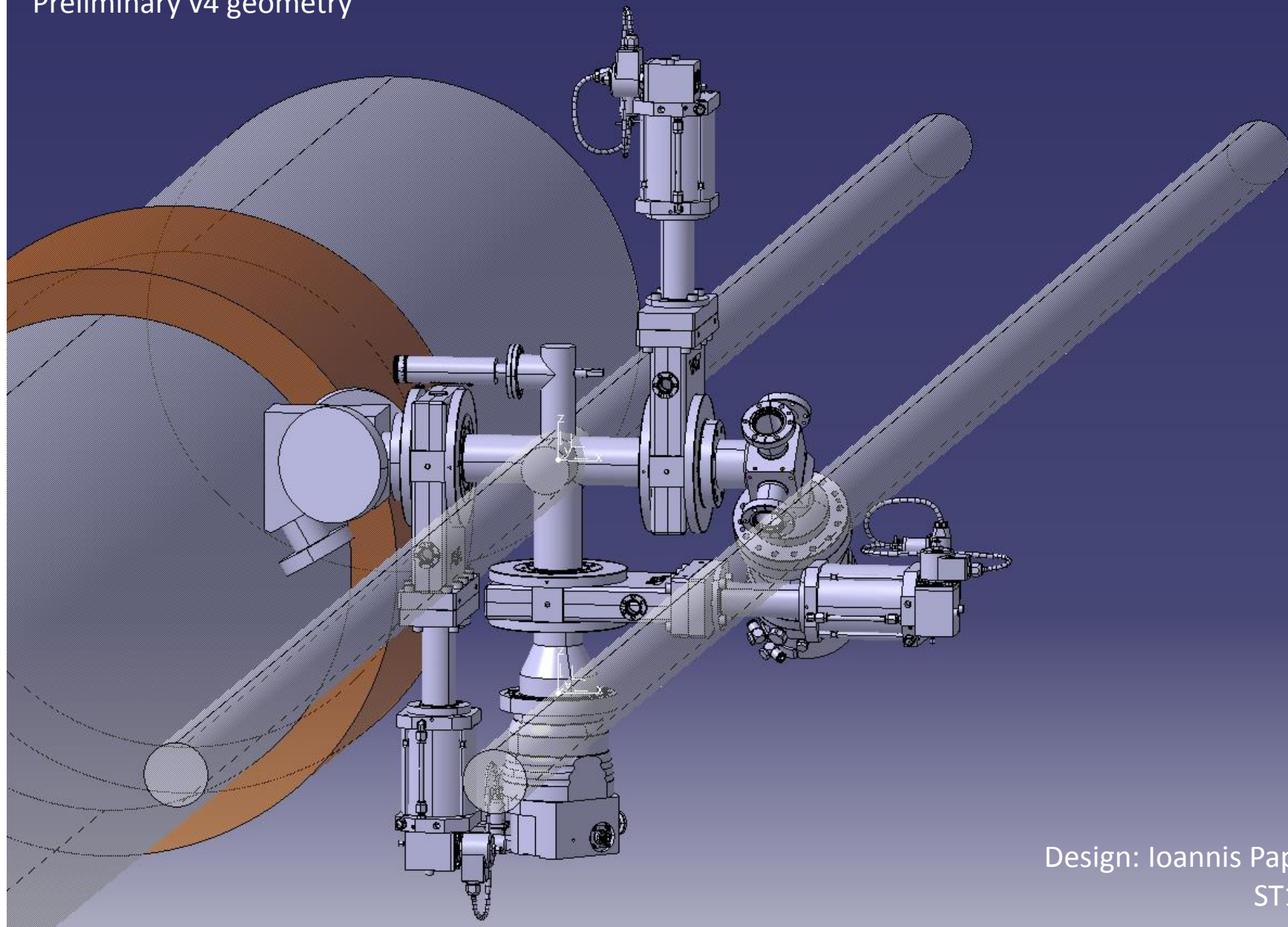


Effects of a more compact system (see <https://indico.cern.ch/event/963280/>)

3) Shorter expansion path and wider jet



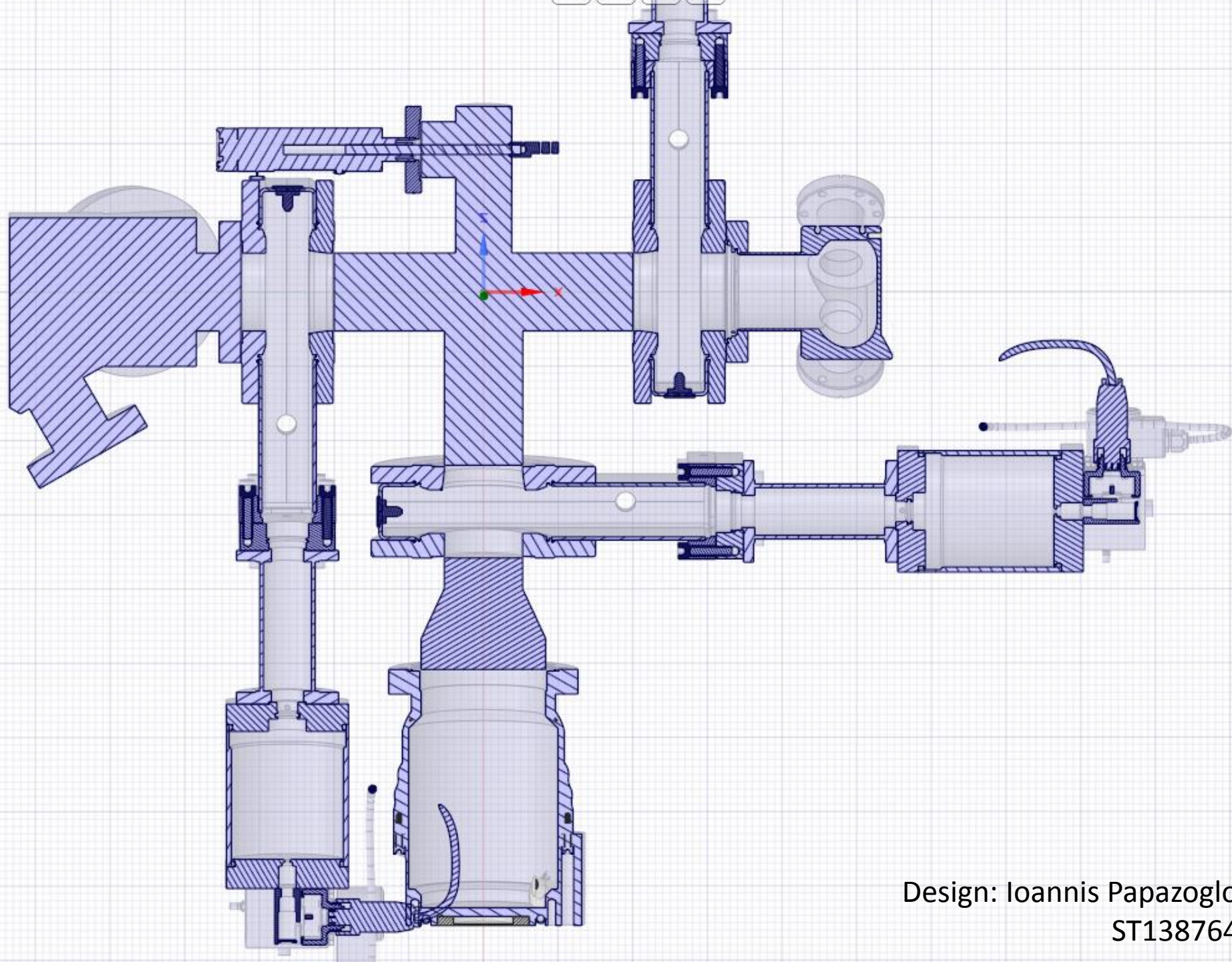
Preliminary v4 geometry



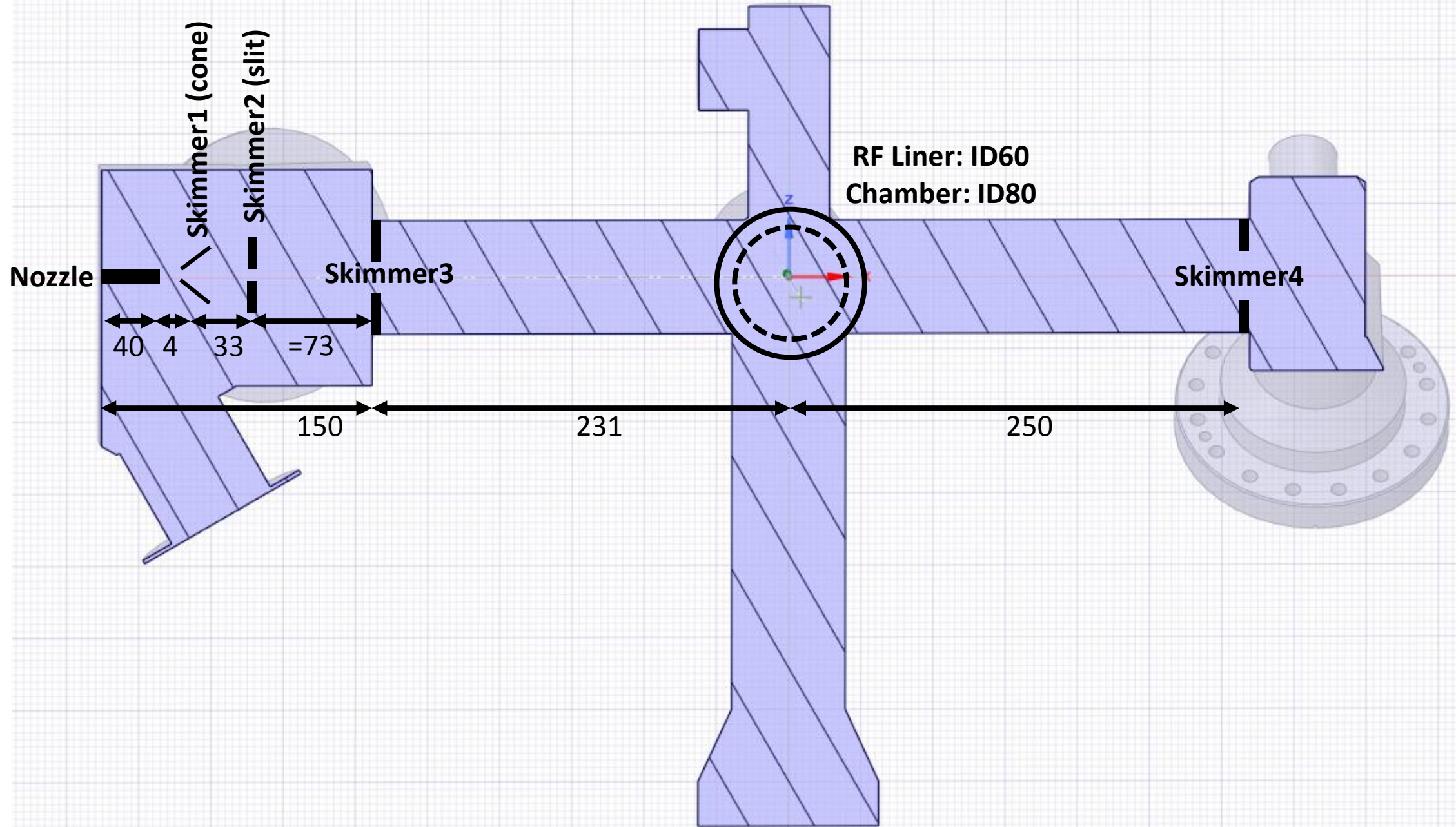
Design: Ioannis Papazoglou

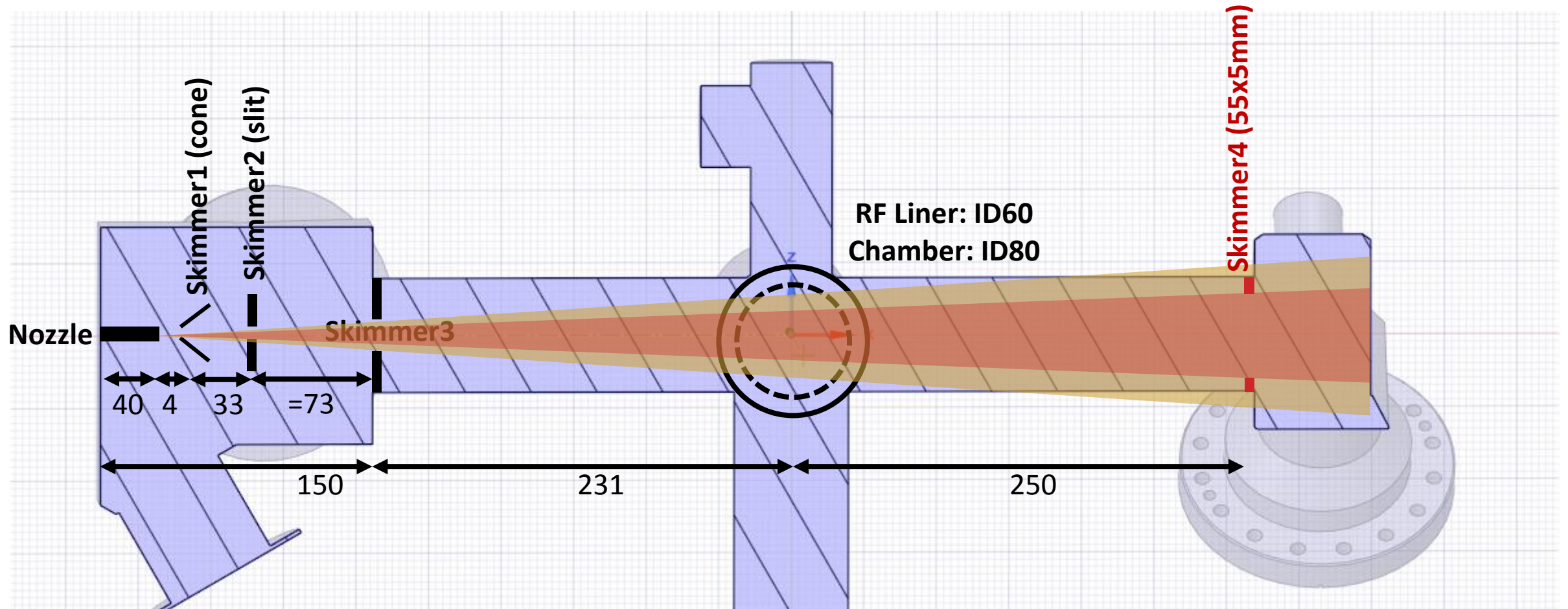
ST1387645





Design: Ioannis Papazoglou
ST1387645

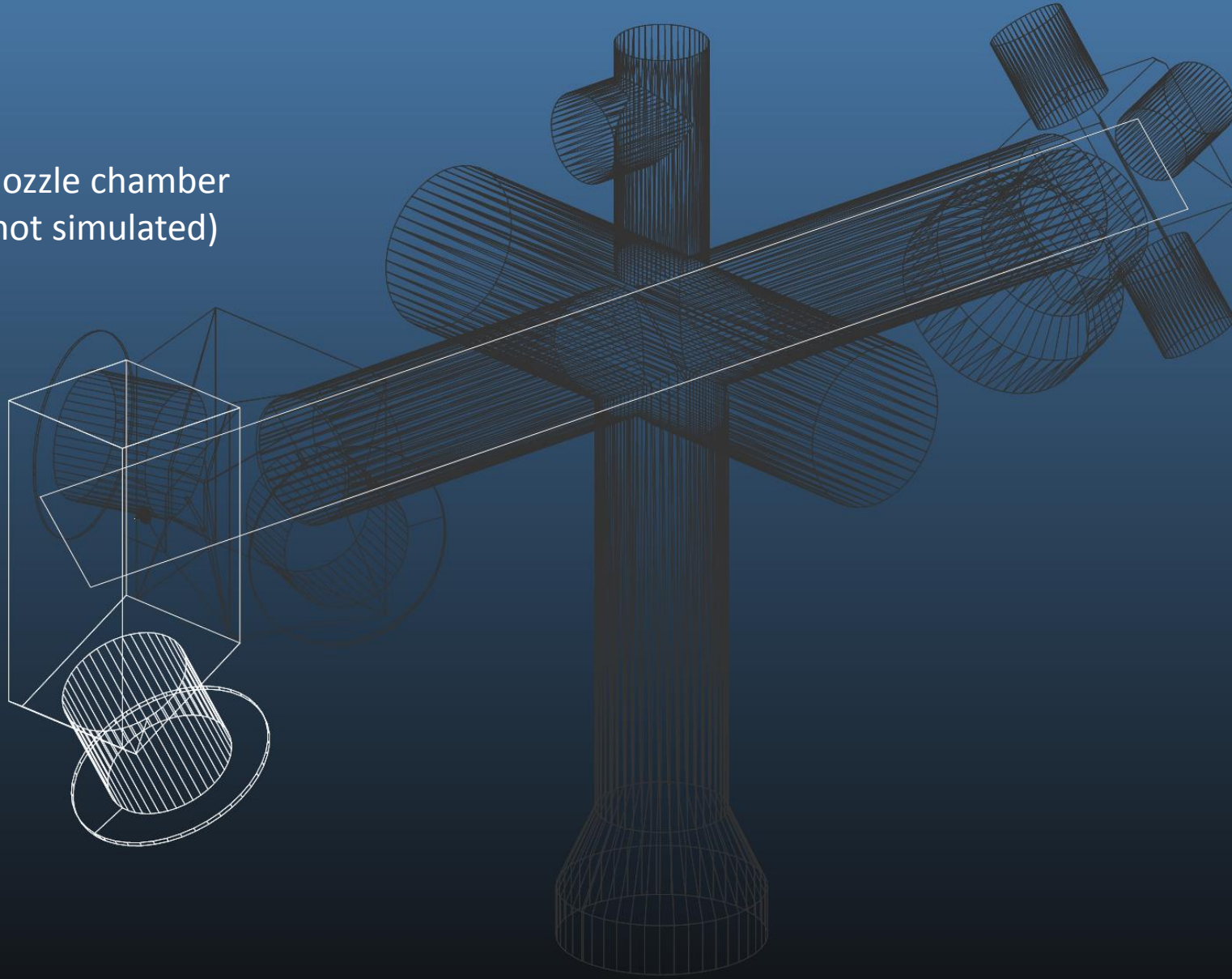




Jet size

Nozzle	Skimmer 2	Skimmer 3	IP	Skimmer4
0	4.5 x 0.2 mm (2mm thick)	13 x 0.55 mm (2mm thick)	40 x 1.66 mm	69 x 2.87 mm (removed)
	3.3 x 0.2 mm	10 x 0.55 mm	28.7 x 1.66 mm	50 x 2.87 mm

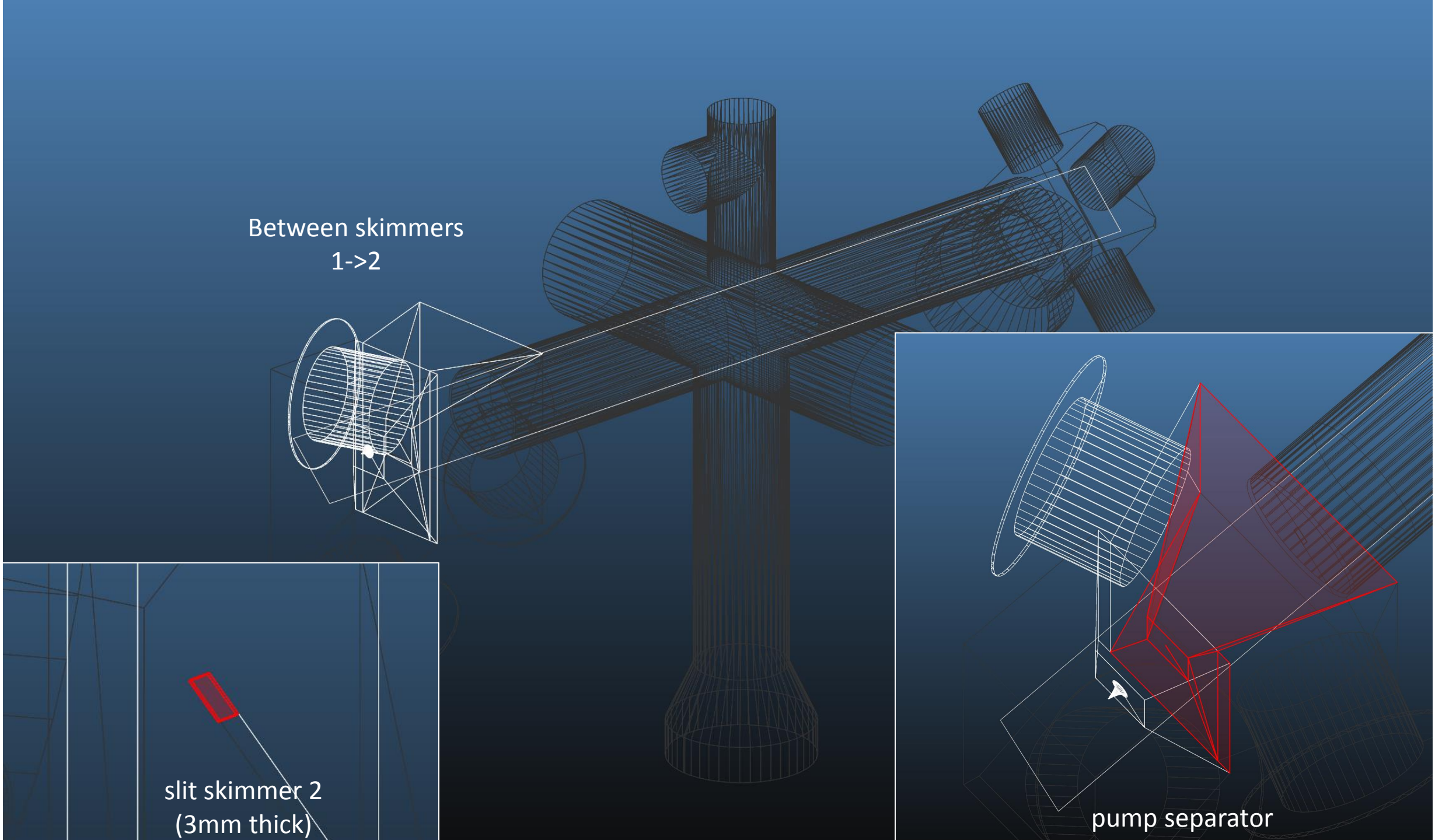
Nozzle chamber
(not simulated)



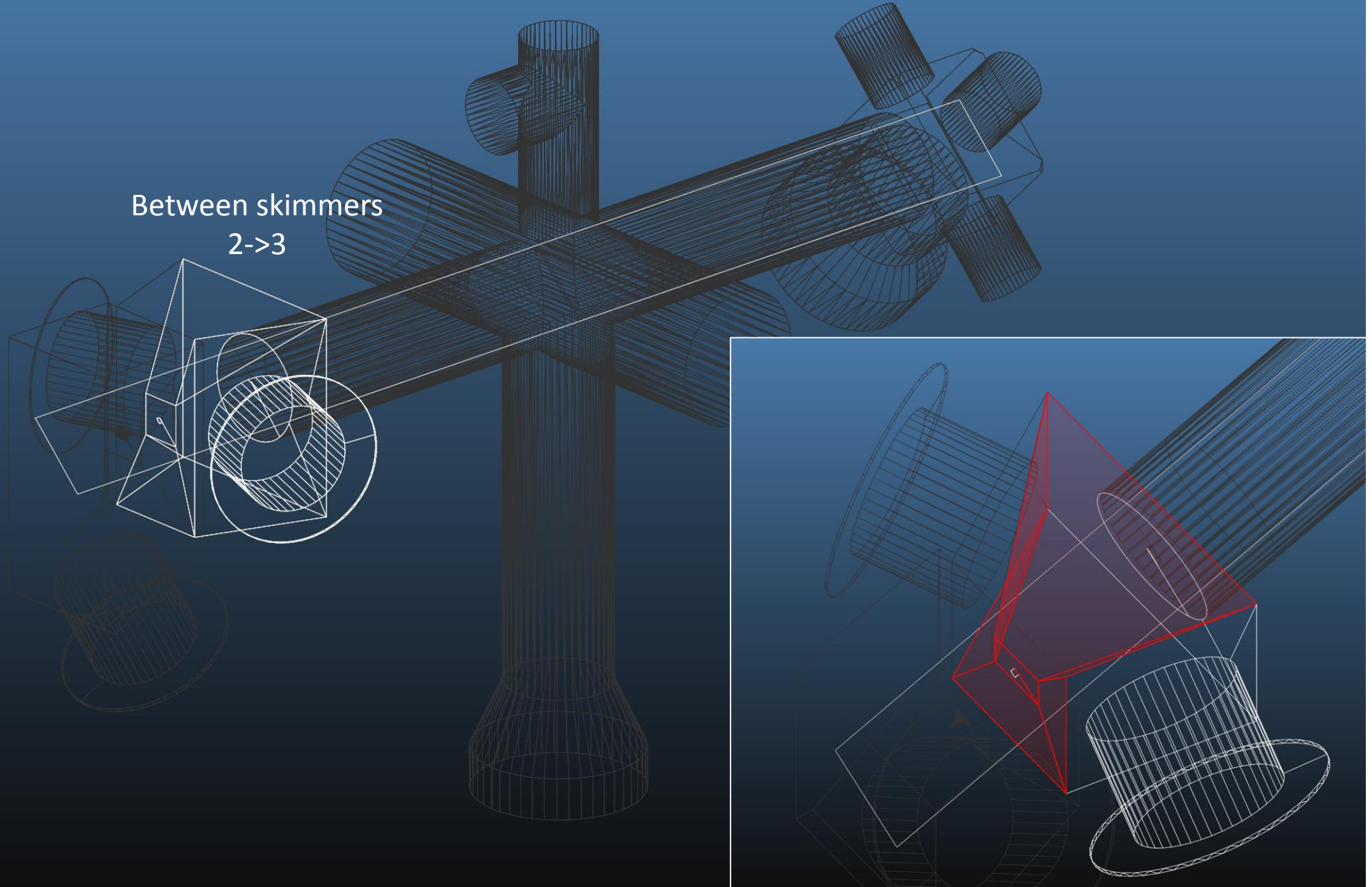
Between skimmers
1->2

slit skimmer 2
(3mm thick)

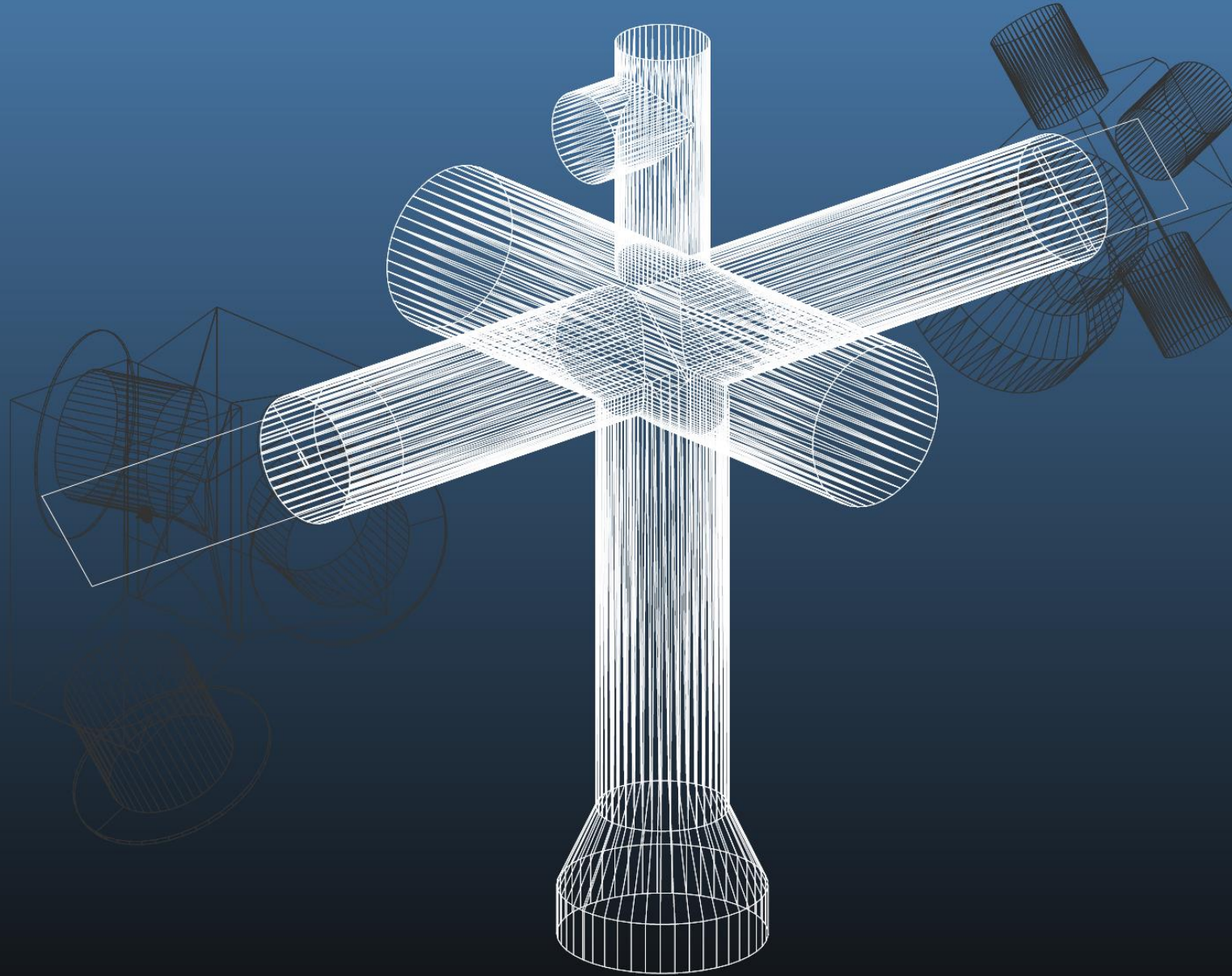
pump separator



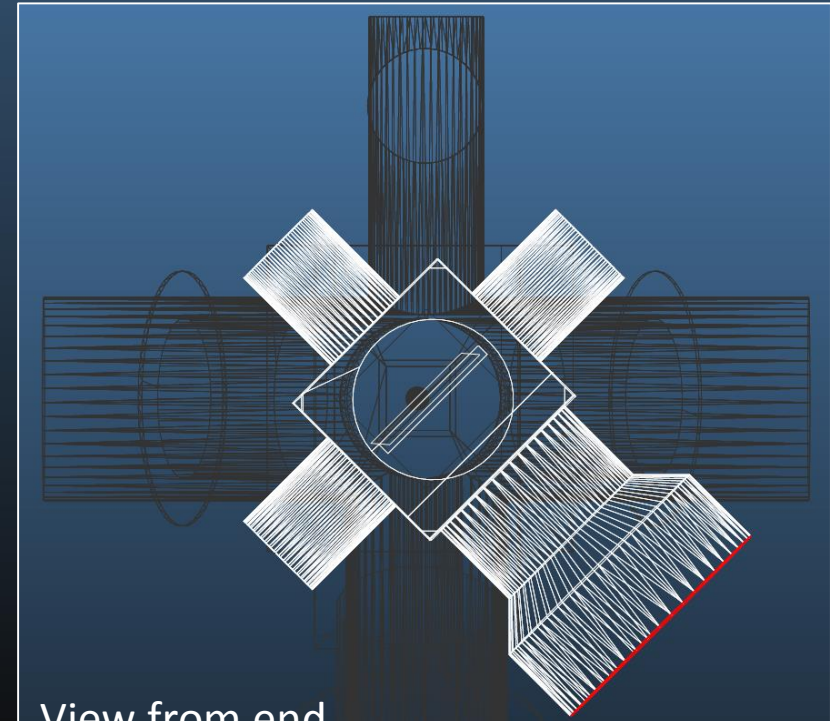
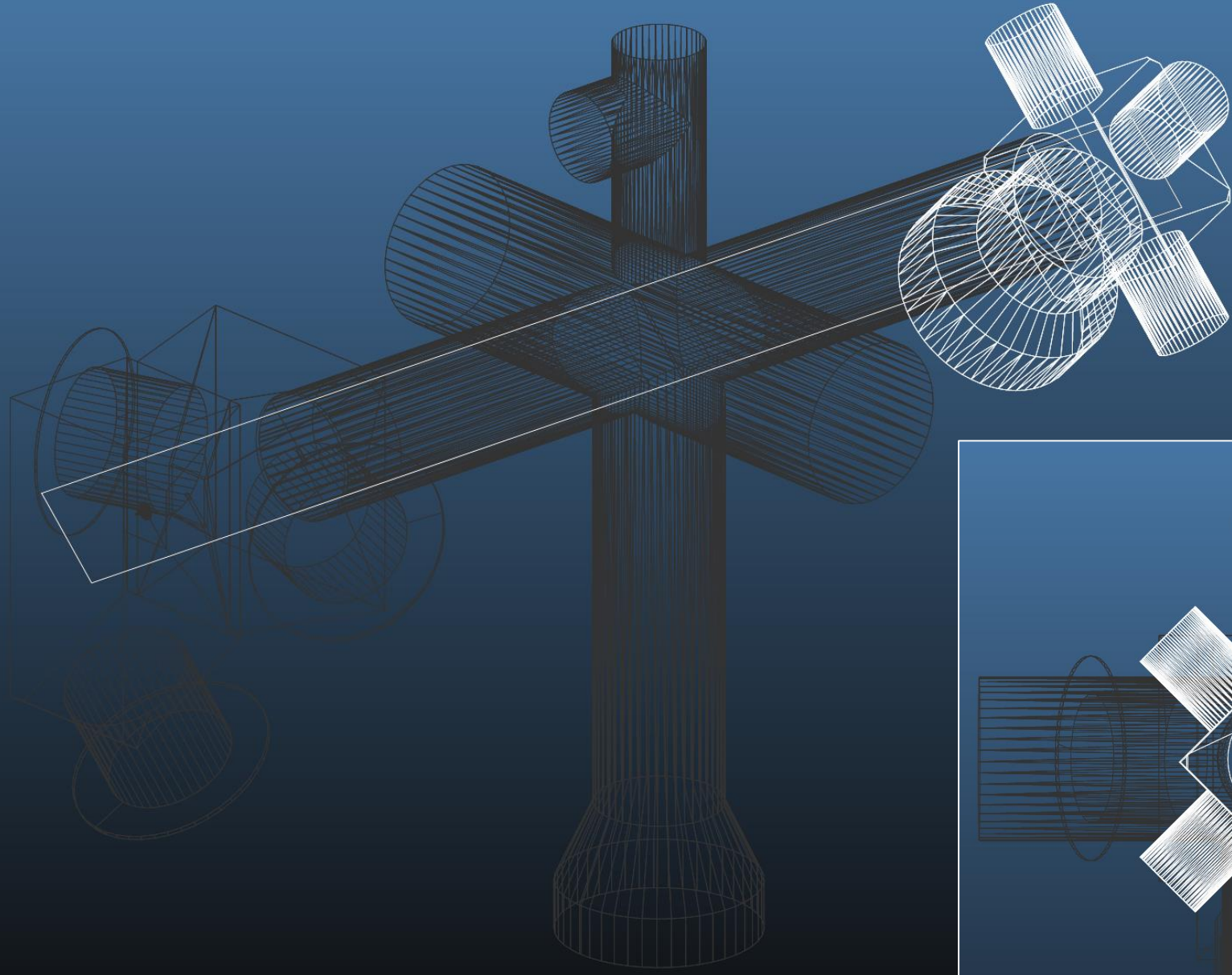
Between skimmers
2->3



Interaction chamber
(liner omitted)

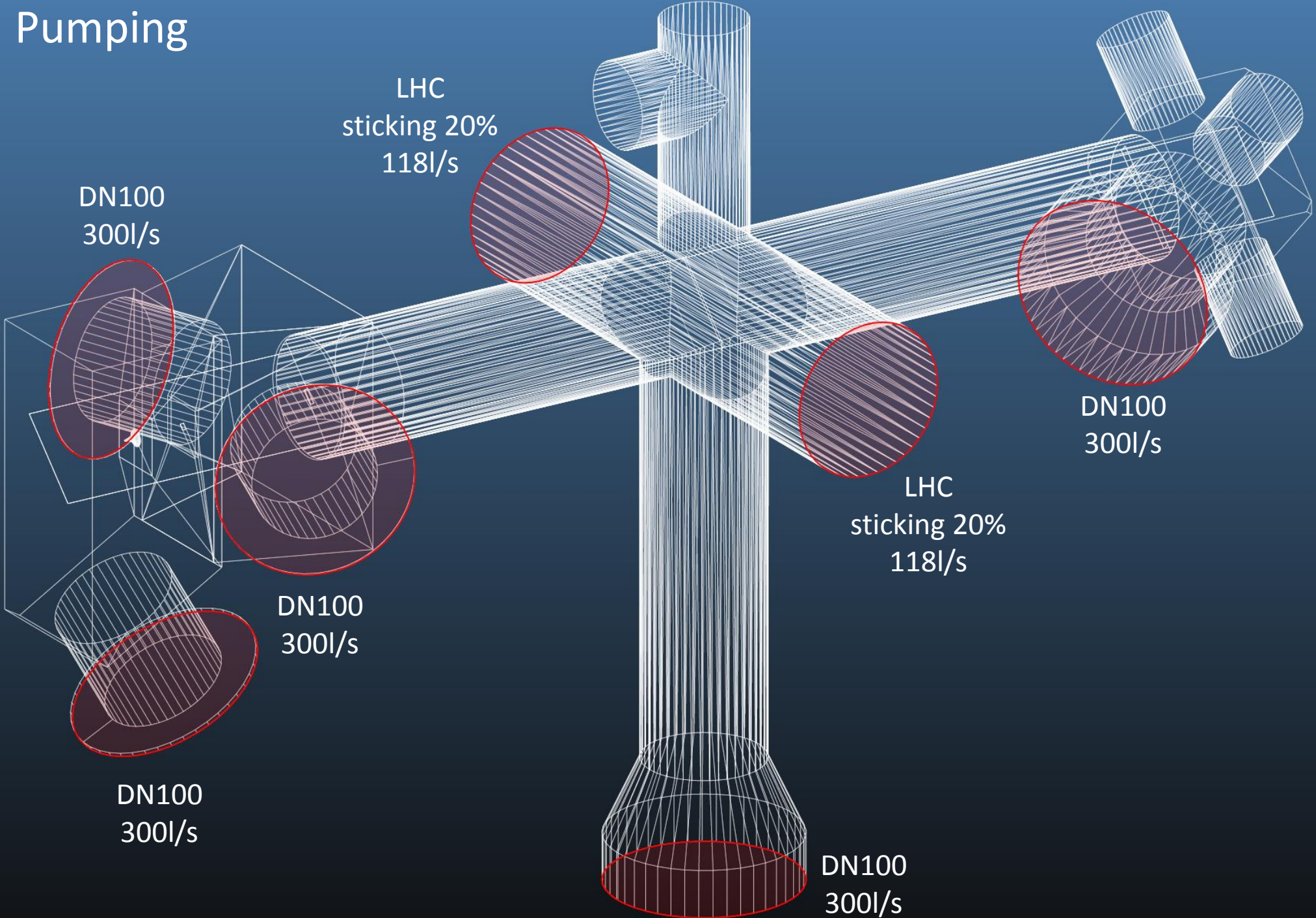


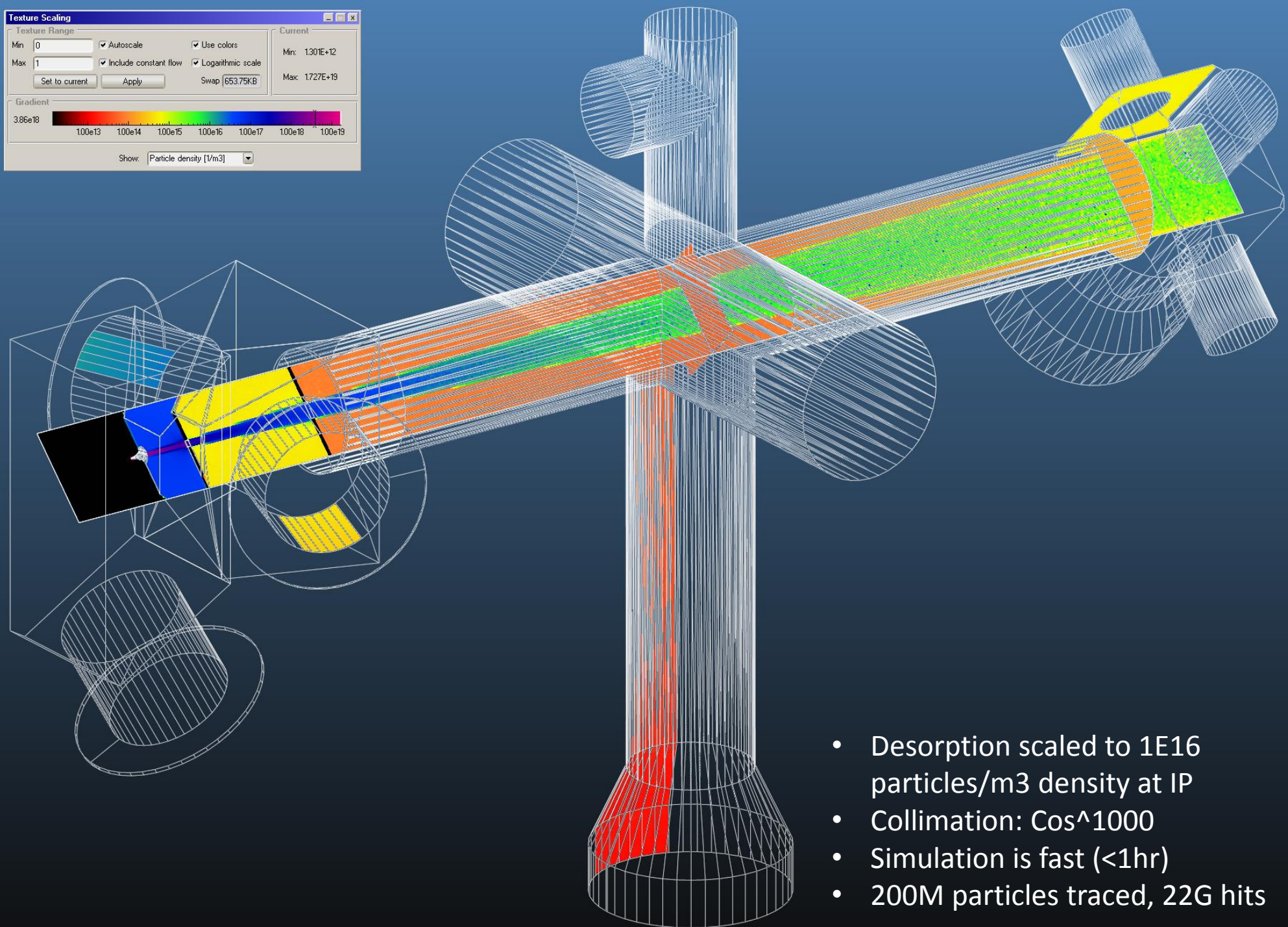
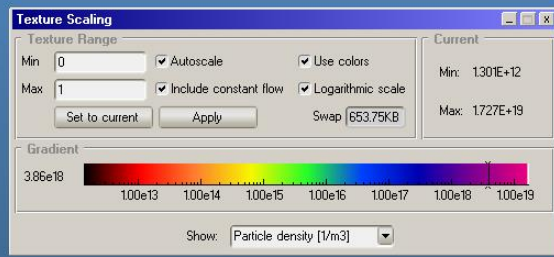
Dump area
(mirror omitted)



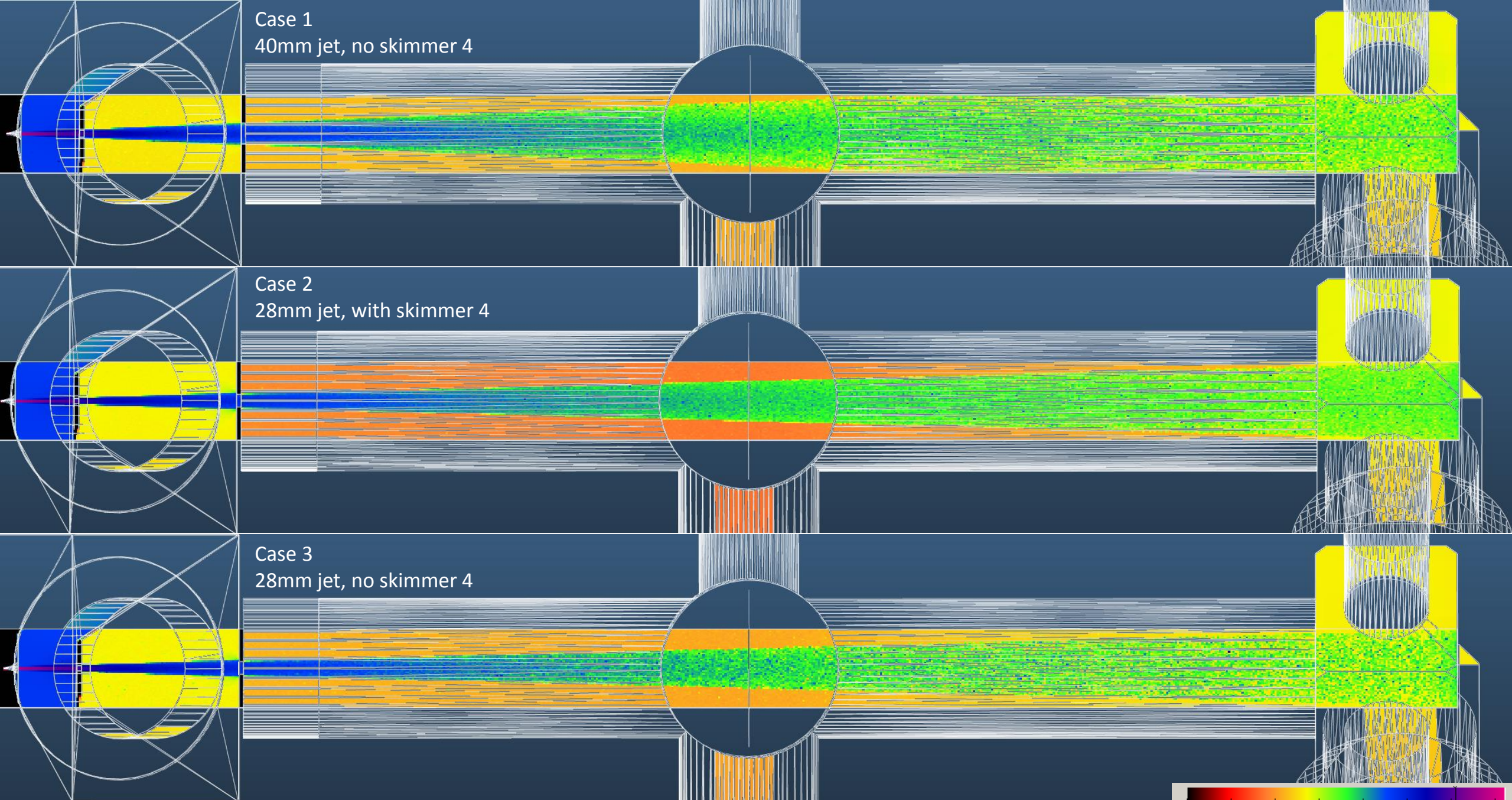
View from end

Pumping





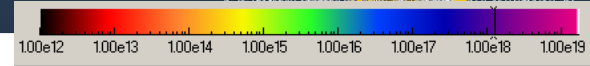
- Desorption scaled to $1E16$ particles/m³ density at IP
- Collimation: Cos^{1000}
- Simulation is fast (<1hr)
- 200M particles traced, 22G hits



Case 1
40mm jet, no skimmer 4

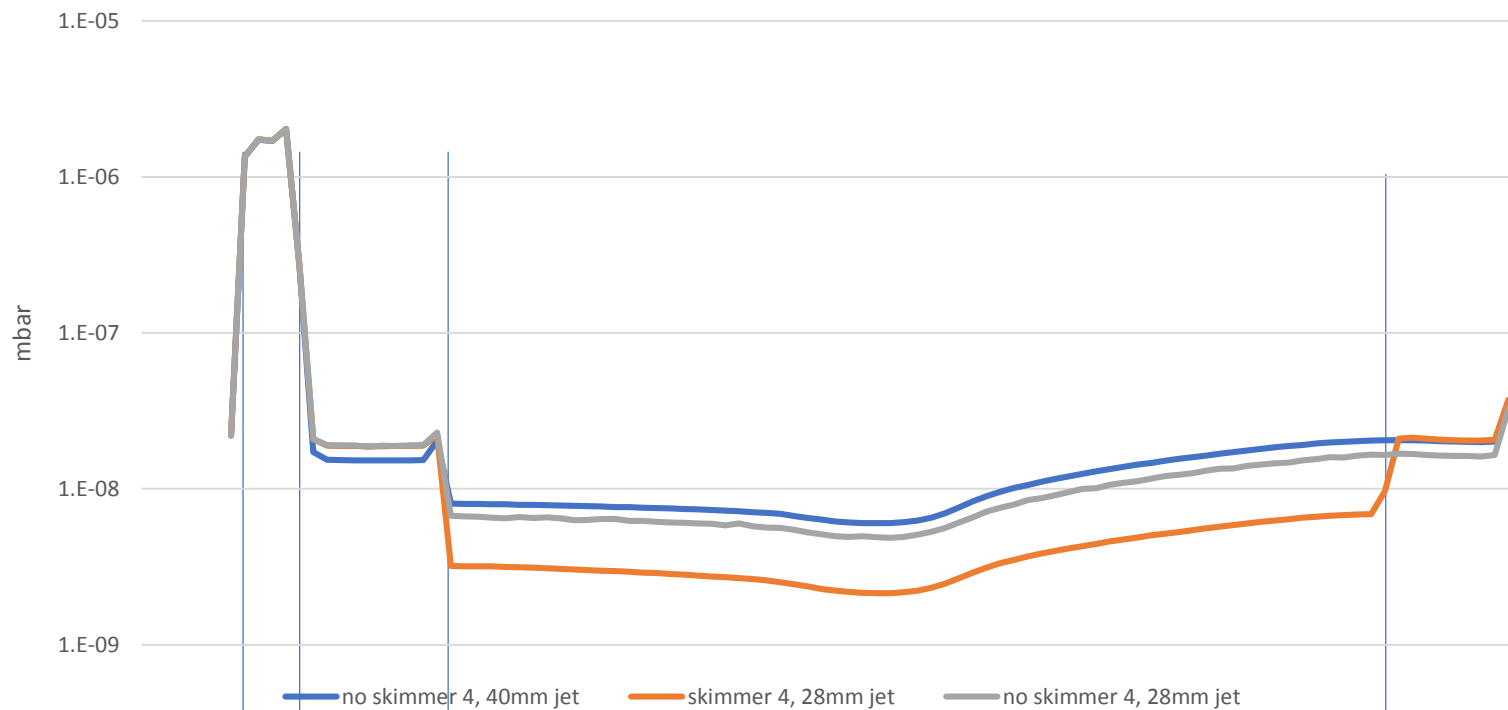
Case 2
28mm jet, with skimmer 4

Case 3
28mm jet, no skimmer 4

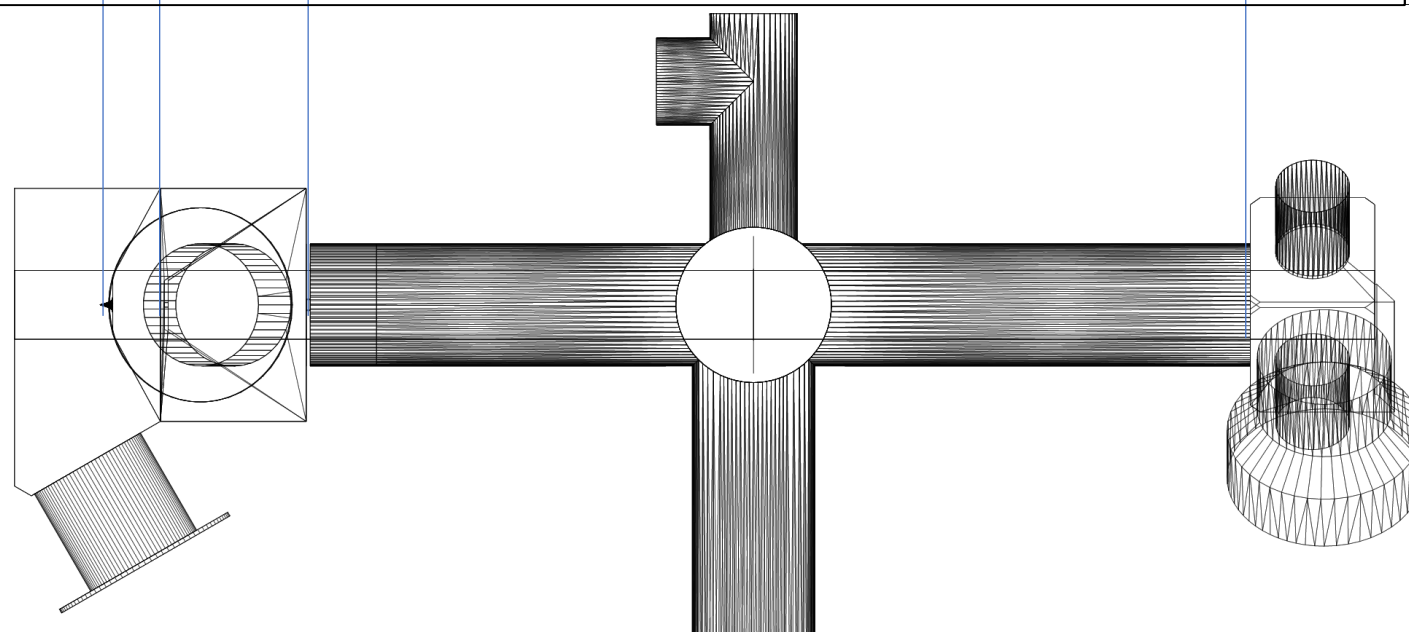
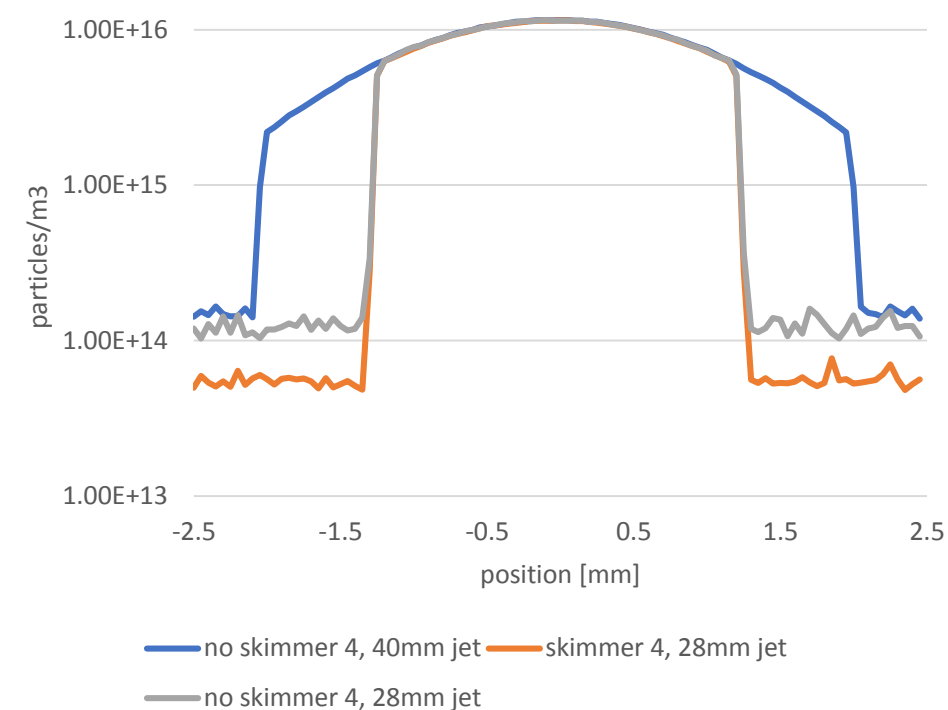


Show: Particle density [1/m³]

Pressure along system



Jet density at IP



LHC loads	mbar.l/s
no skimmer 4, 40mm jet	1.10E-06
skimmer 4, 28mm jet	4.00E-07
no skimmer 4, 28mm jet	9.00E-07

Conclusion

- Making the instrument (and pumps) smaller creates several disadvantages to vacuum
- Same for larger gas jet width
- We have two powerful assets to make significant difference:
 - Skimmer 4 – but can we keep it? (jet width 40mm -> 28mm)
 - Slit skimmer 2 – proposed at last collaboration meeting, very big (1.5 order of magnitude) impact... ...if we can manufacture and align it
- This “alpha version” instrument is predicted to work
- It is still on the drawing table, many ideas to make performance better