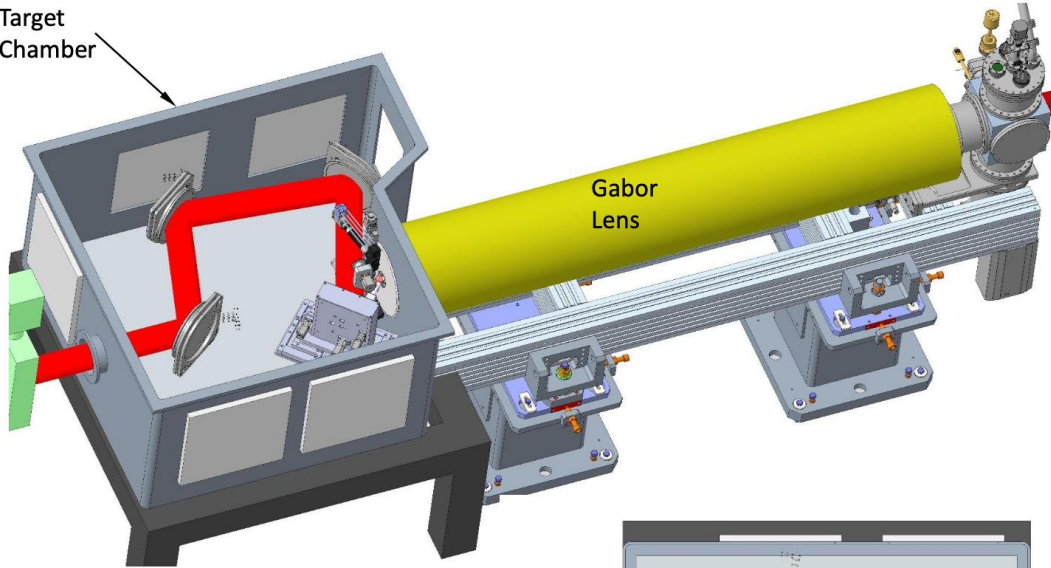


# LhARA Target Chamber Vacuum Simulations

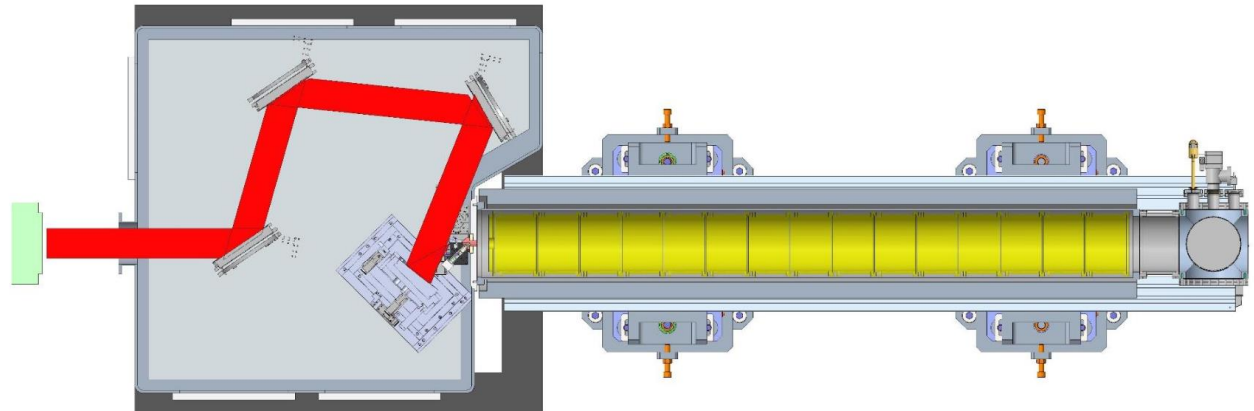
Keith Middleman  
ASTeC Vacuum Solutions Group  
STFC Daresbury Laboratory

# LhARA Target Design

Target Chamber



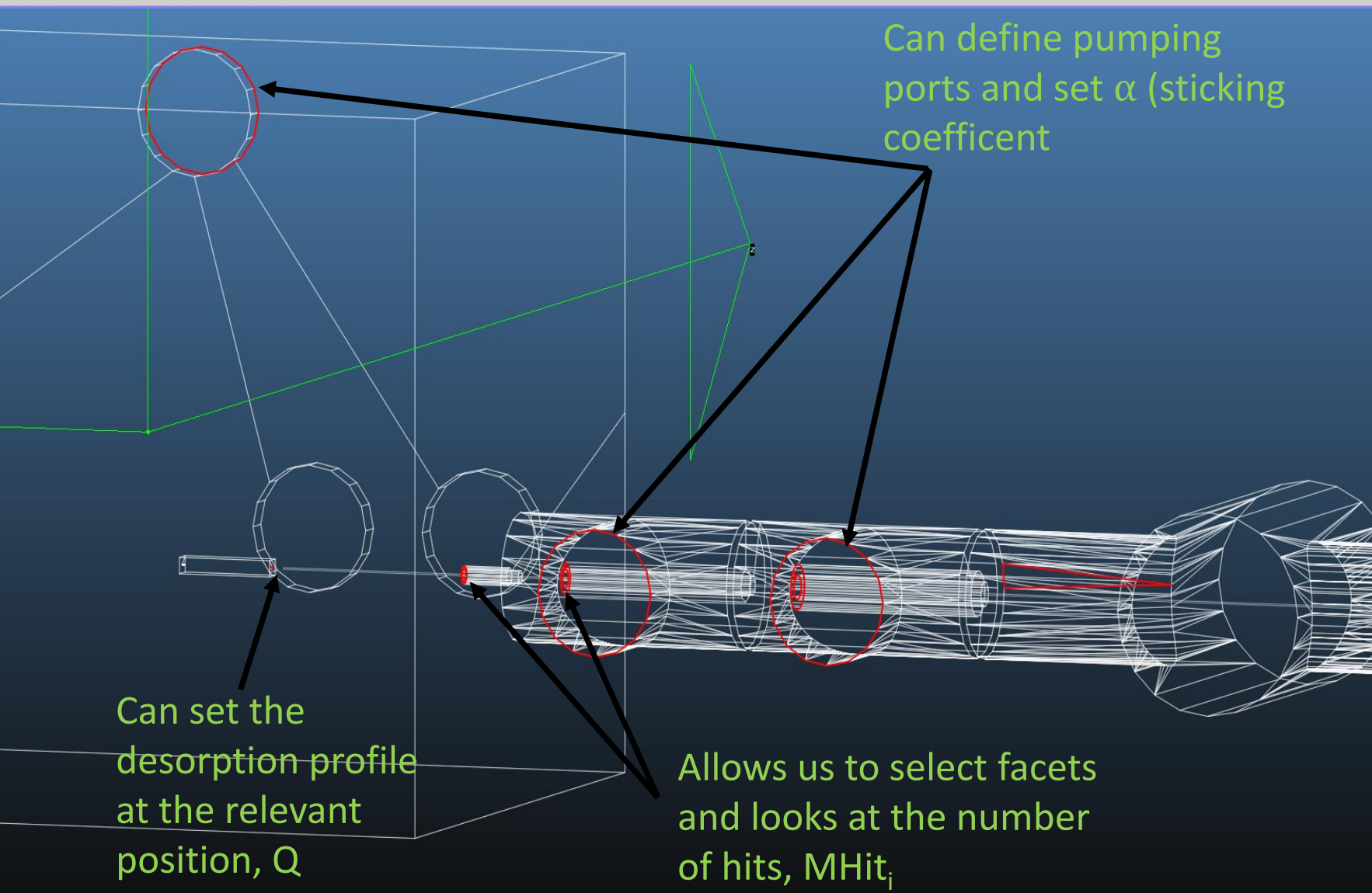
LhARA Target Chamber and Gabor Lens



# Overview of MOLFLOW+

## Keith Middleman

File Selection Tools Facet Vertex View Test Time About



Can define pumping ports and set  $\alpha$  (sticking coefficient)

Can set the desorption profile at the relevant position,  $Q$

Allows us to select facets and looks at the number of hits,  $MHit_i$

V:\1468 F:2022 Dim(1170,16)

3D Viewer settings

- Rules
- Normals
- Lines
- Leaks
- Volume
- Texture
- View
- Vertices

Selected Facet (9 s)

Particles in

Desorption

Outgassing (mbar/l/s)

Outg/area(mbar/l/s/cm

Particles out

Sticking factor:

Pumping Speed (l/s):

Sides: 1 Sided

Opacity: 1

Temperature (K): 293

Sum Area (cm<sup>2</sup>): 1595

Profile: None

<< Adv Details... Coord

Shortcuts

Profile pl Texture pl

Simulation

<< Sim Resume

Auto update scene

Hits: 47.57 Ghit (0.0 hit/s)

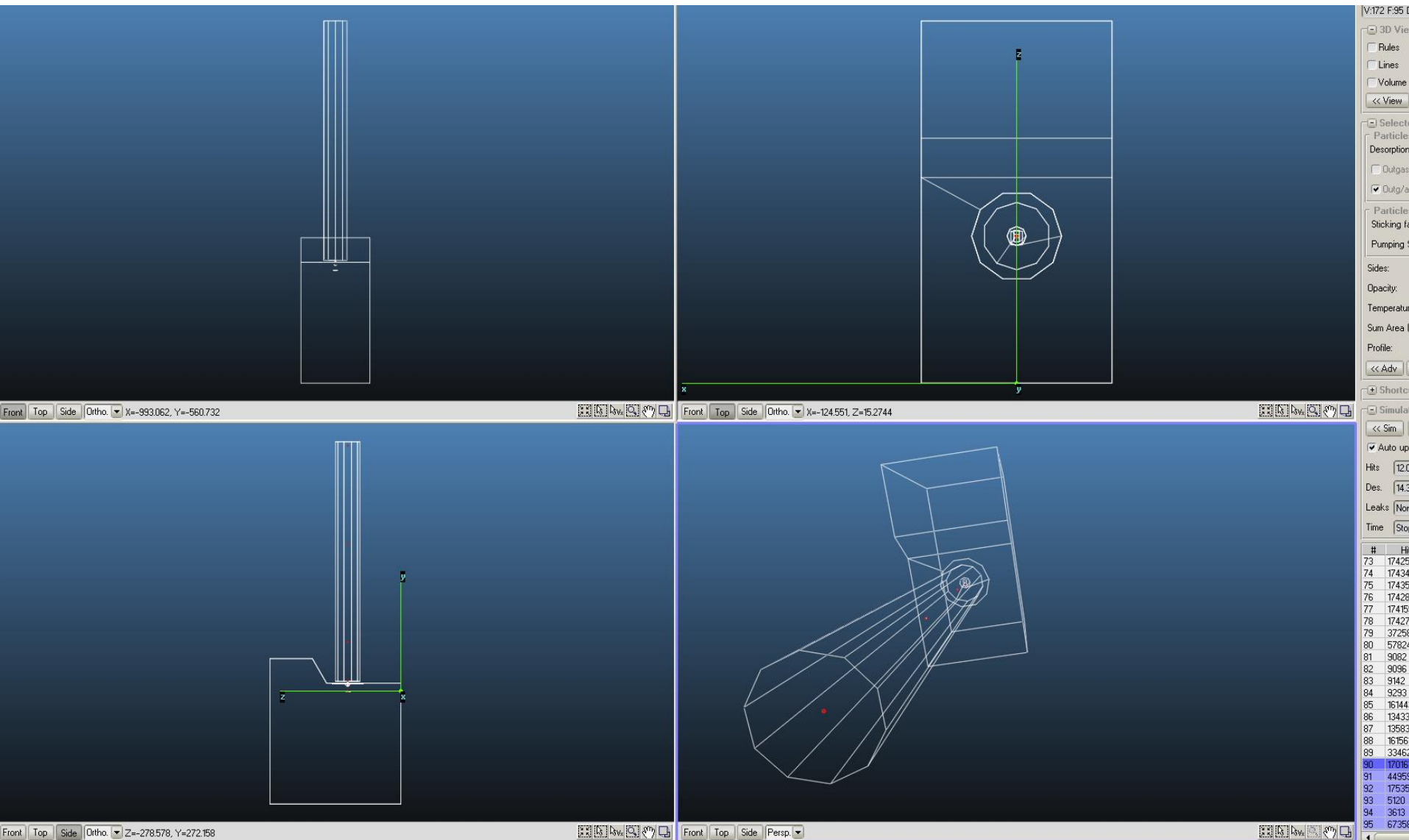
Des: 48.36 Mdes (0.0 d/s)

Leaks: None

Time: Stopped: 00:00:00

#	Hits	Des
282	7747	0
283	2985	0
284	552	0
285	2338	0
286	7542	0
287	3853	0
288	2628	0
289	3849	0
290	8860	0
291	571	0
292	2307	0
293	2979	0
294	1921	0
295	8799	0
296	240	0
297	1587	0
298	8818	0
299	256	0
300	1427	0
301	456	0
302	3635	0

# Overview of MOLFLOW+





# Results

## ITRF Transmission Probability Results

Position along vessel	Cosine Desorption		CosN = 2 Desorption		CosN = 10 Desorption		CosN = 100 Desorption	
	Number of hits	Transmission Probability (w)	Number of hits	Transmission Probability (w)	Number of hits	Transmission Probability (w)	Number of hits	Transmission Probability (w)
Number of gas molecules generated	2850083		4554821		2707689		14327524	
Entrance to nozzle (4 mm)	15761	5.53E-03	31061	6.82E-03	48074	1.78E-02	1701677	1.19E-01
Exit of nozzle (5.4 mm)	2063	7.24E-04	4626	1.02E-03	9767	3.61E-03	449590	3.14E-02
1/4 way along Gabor Lens	79	2.77E-05	184	4.04E-05	383	1.41E-04	17535	1.22E-03
1/2 way along Gabor Lens	28	9.82E-06	55	1.21E-05	120	4.43E-05	5120	3.57E-04
End of 1st Gabor Lens	18	6.32E-06	47	1.03E-05	79	2.92E-05	3613	2.52E-04

**Transmission Probability represents the probability of a gas molecule generated in position X reaching position Y.**

**To achieve the 2 orders of magnitude pressure difference required between the target chamber and the Gabor Lens we are looking for the transmission probability to be better than 0.01 or 1E-2**