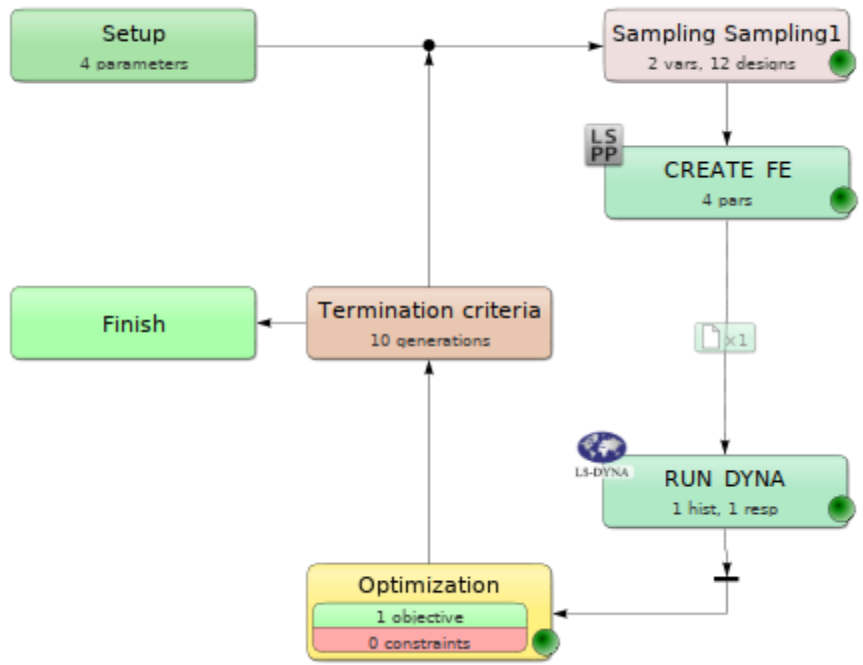
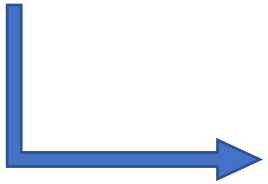
LS-OPT Set-up


Setup
4 parameters
Sampling Sampling1
2 vars, 12 designs
LS PP
CREATE FE
4 pars
Finish
Termination criteria
10 generations
x1
LS-DYNA
RUN DYNA
1 hist, 1 resp
Optimization
1 objective
0 constraints

Simulation time

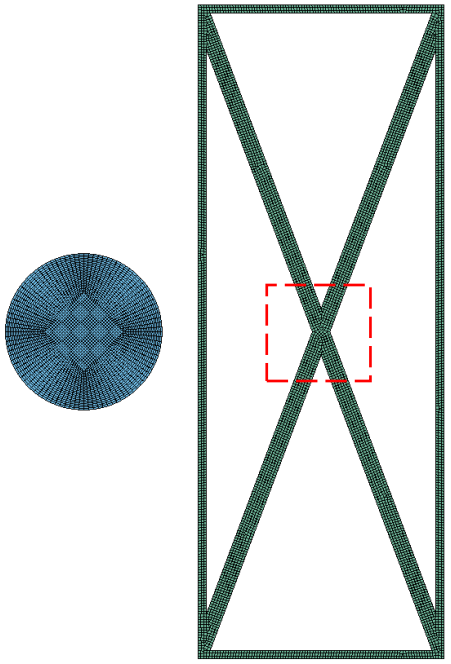
- 3D computationally expensive
  - Computational time full 3D – 64 CPU -> 12h
  - 10 iterations, population size 12 -> ~5 days



- Approximate using (semi-)2D simulations
  - Simulation time ~1 min
  - Optimization time ~15 min

- Plug in optimized 2D parameters in full 3D model

Model



1. Minimization w.r.t. residual velocity
2. Minimization w.r.t. kinetic energy

- Reference: Monolithic shield with equal mass

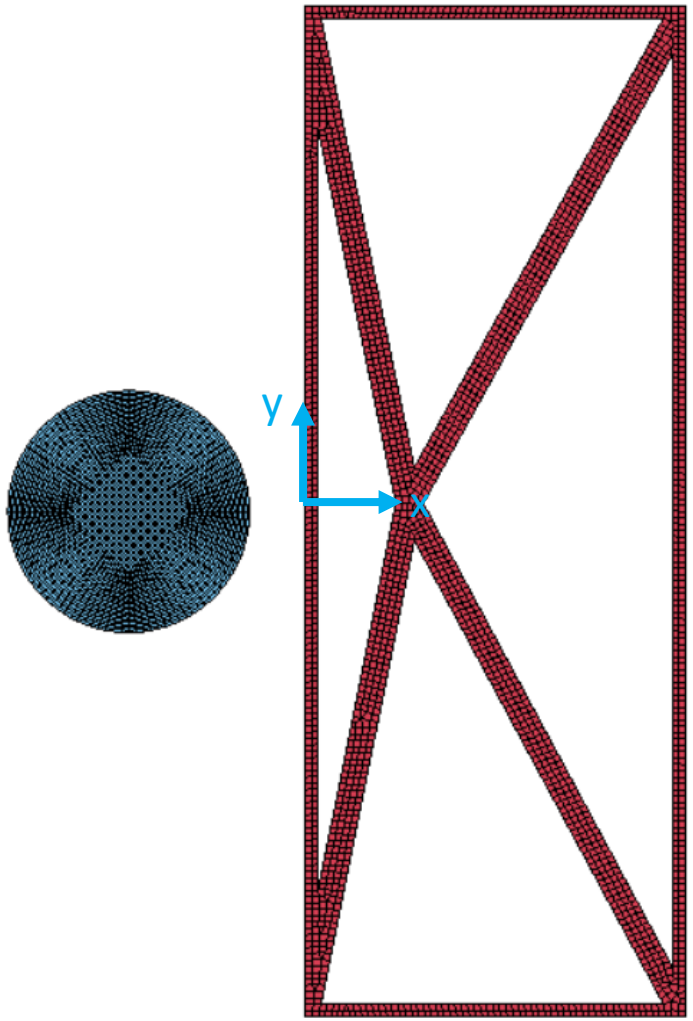
- Material used: AA6070-O
- We tried AM but unstable results (too ductile)

LS-OPT RESULTS

2D

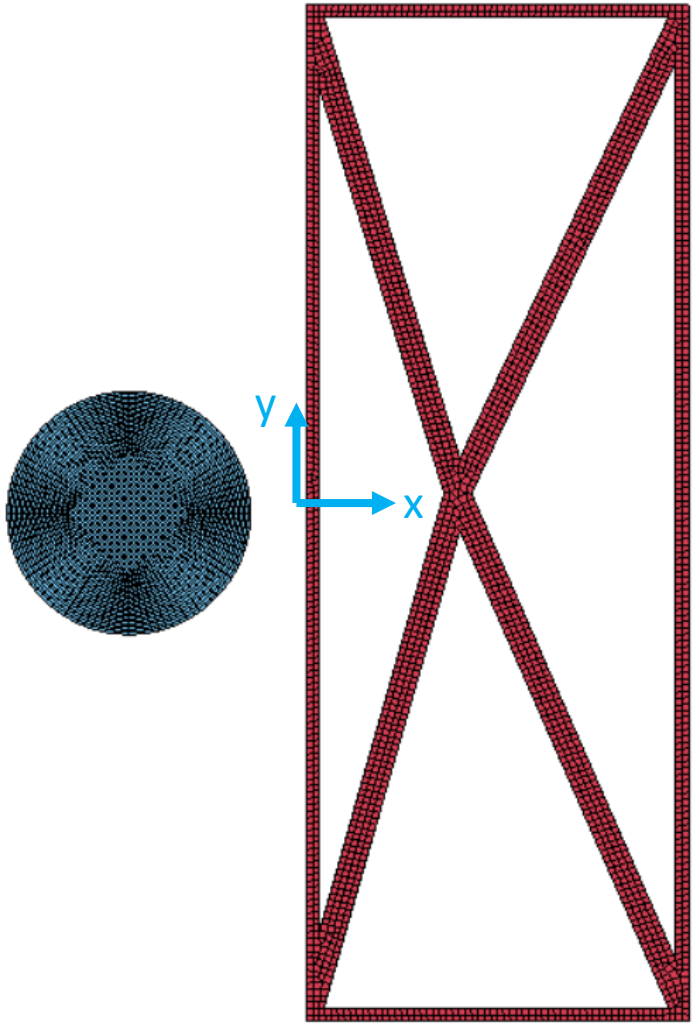
1. Optimization w.r.t. residual velocity

(x,y) = (4.0833, 0.336)



2. Optimization w.r.t. kinetic energy

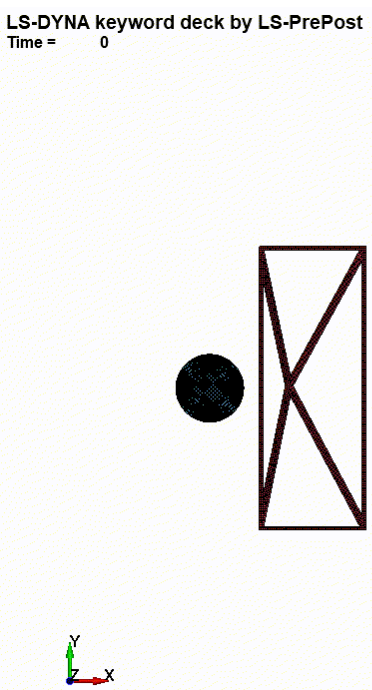
(x,y) = (5.915, 0.7785)



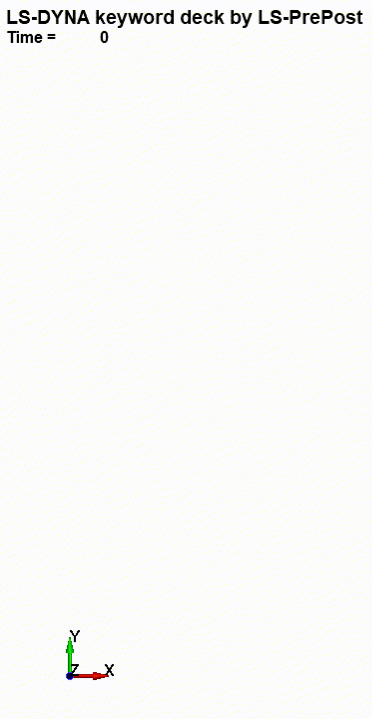
- Inconsistent optimization results
- Depending on initial input, x can be:
  - Close to lower boundary
  - Close to upper boundary
- Energy results unreliable

2D

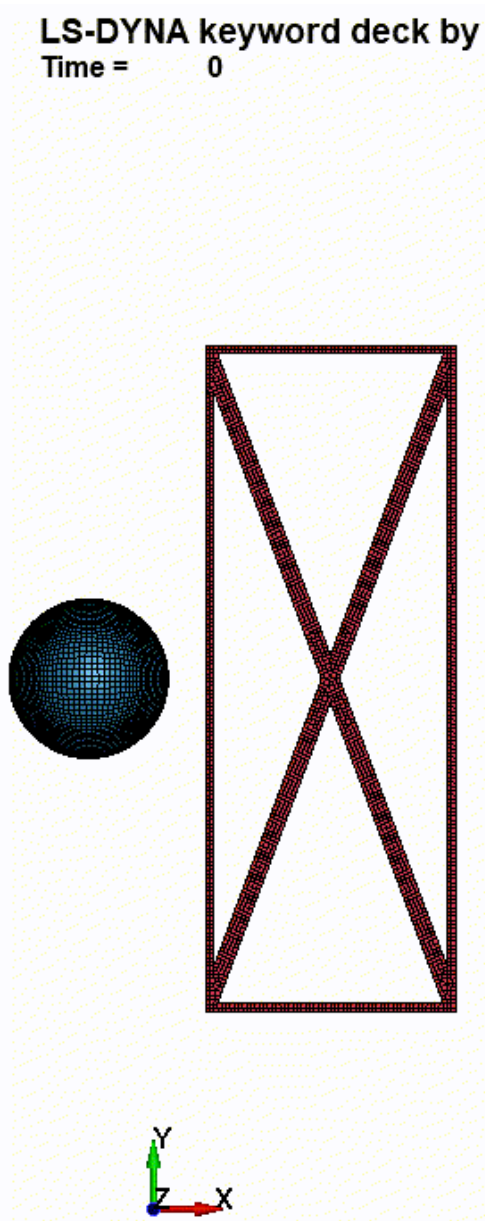
Residual velocity

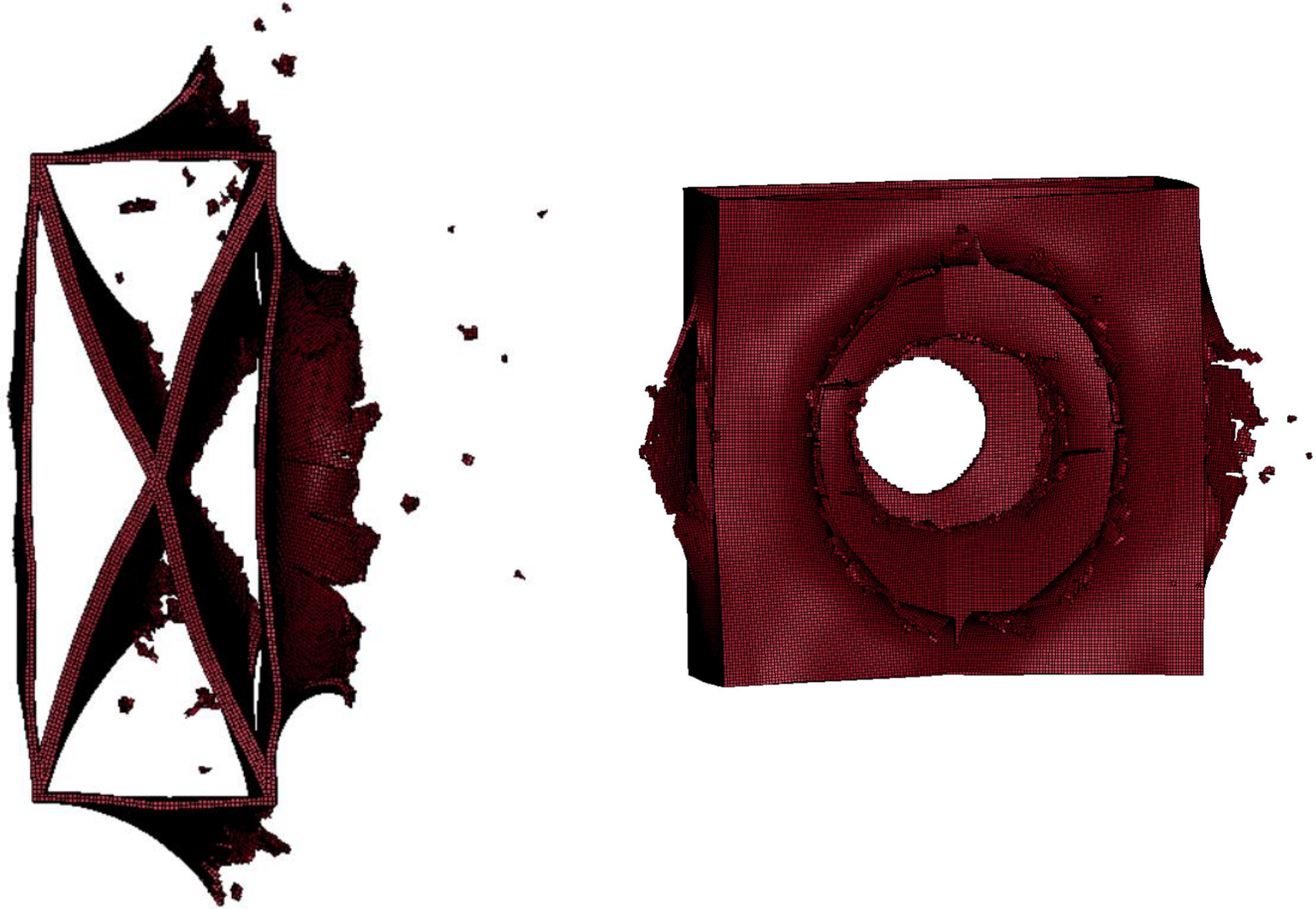


Kinetic energy



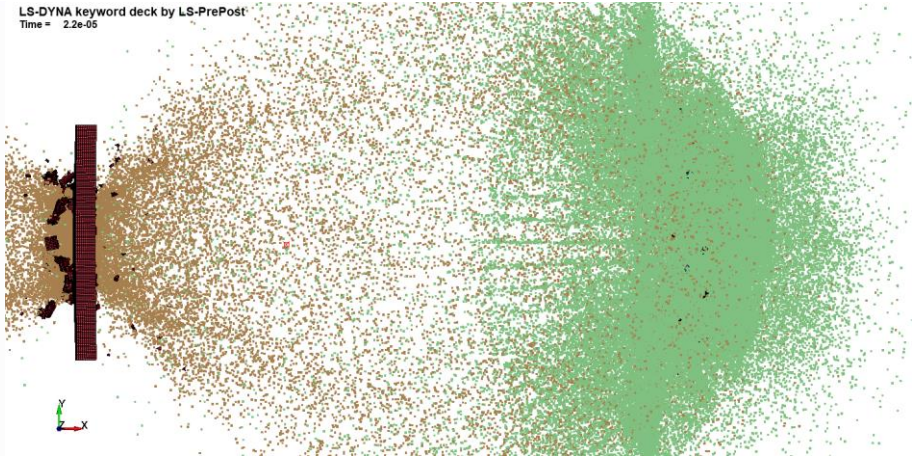
3D - unoptimized



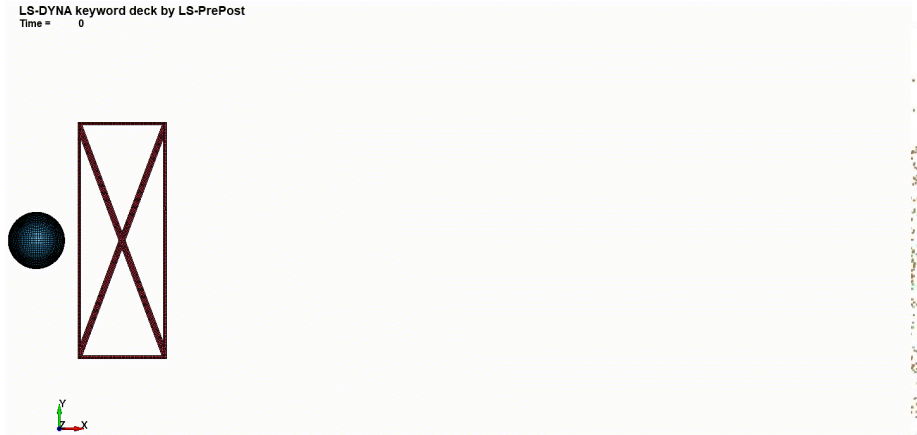


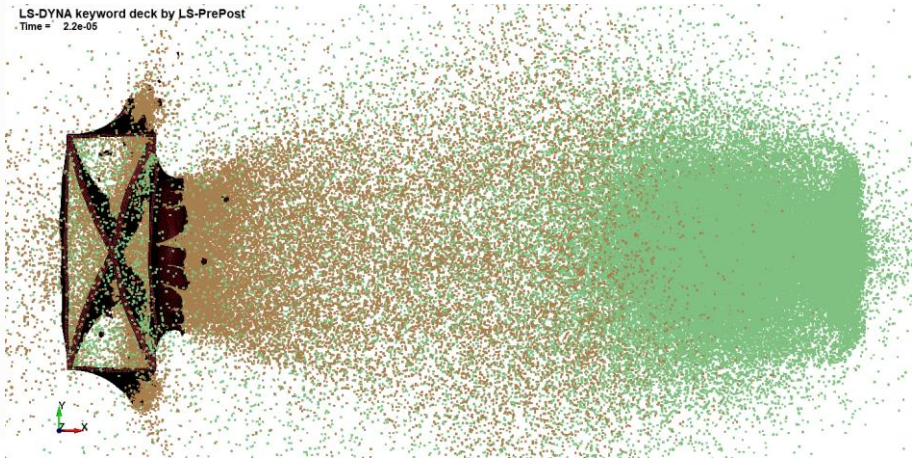
3D – comp.

Monolithic

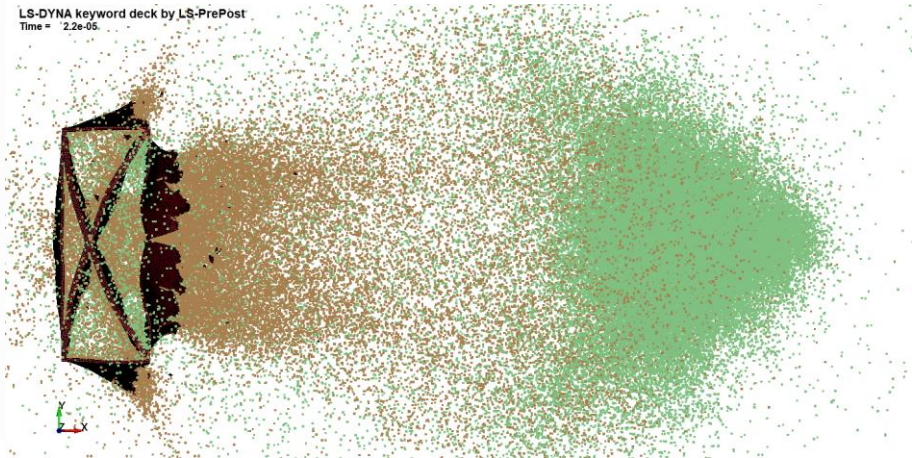


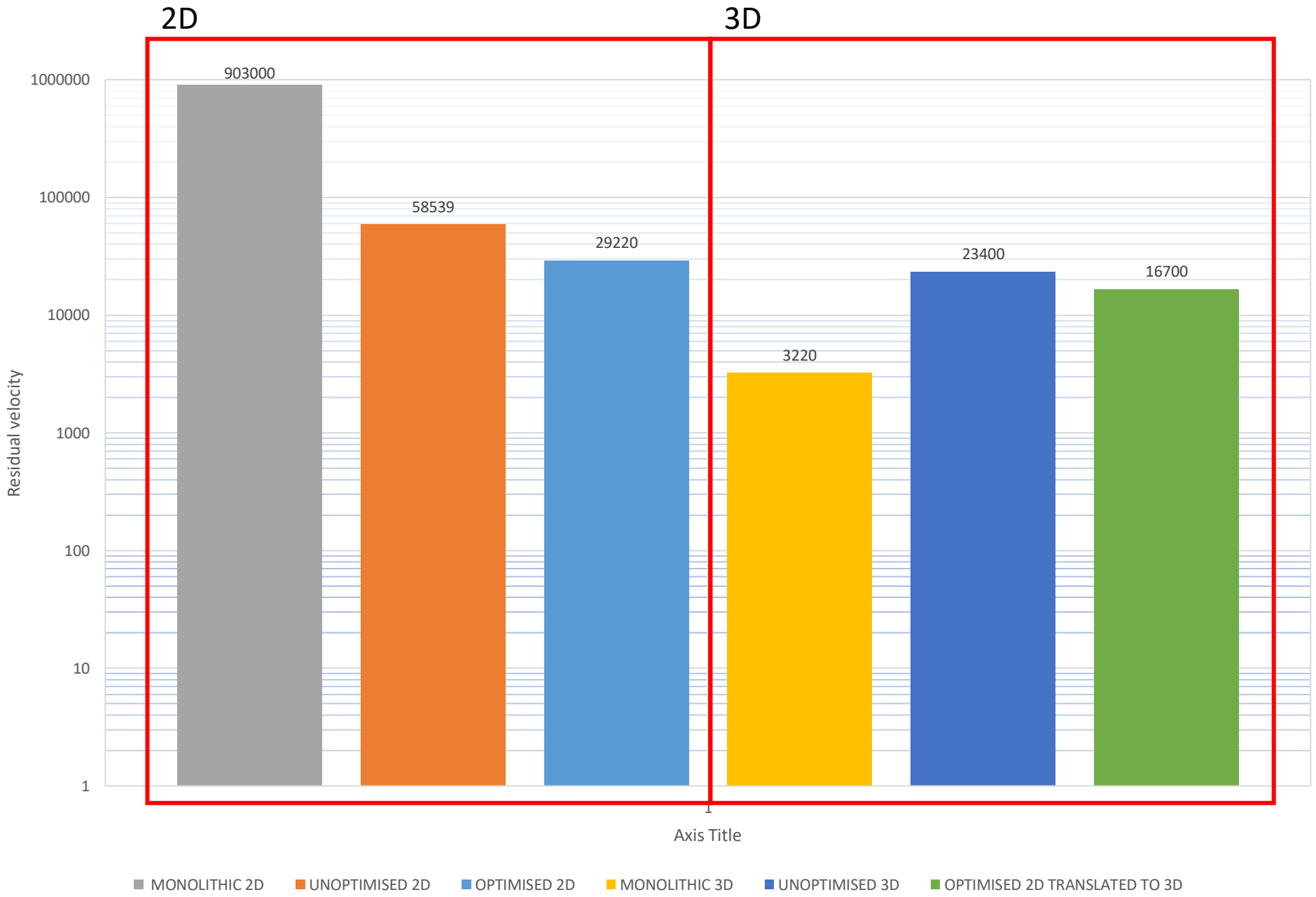
Unoptimized X





Optimized X




2D
3D
1000000
100000
10000
1000
100
10
1
Residual velocity
903000
58539
29220
3220
23400
16700
1
Axis Title
MONOLITHIC 2D
UNOPTIMISED 2D
OPTIMISED 2D
MONOLITHIC 3D
UNOPTIMISED 3D
OPTIMISED 2D TRANSLATED TO 3D

Conclusions

- Optimization with LS-Opt works
- Comparison between similar looking designs possible
- Difficult to optimization w.r.t. energy. Inconsistent results
- Unable to validate optimized model to 2D and 3D monolithic model.

Next steps

- Dual wall set-up. Geometry optimization of second wall
- Write-up