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Electron beam dump, conceptual design as XTD20

- Dimensions and distances confirmation
- Angular positioning / inclination?
- γ beam pipe distance / interference?

- Requirements/ existing know-how / experience on cooling “granularity”?

- Concrete shield specs? thickness, 0.5m?
- Height of assembly from floor, support frame?
- Which degree of freedom for position adjustment of shield / support frame w.r.t. floor?
  - range of position adjustment?

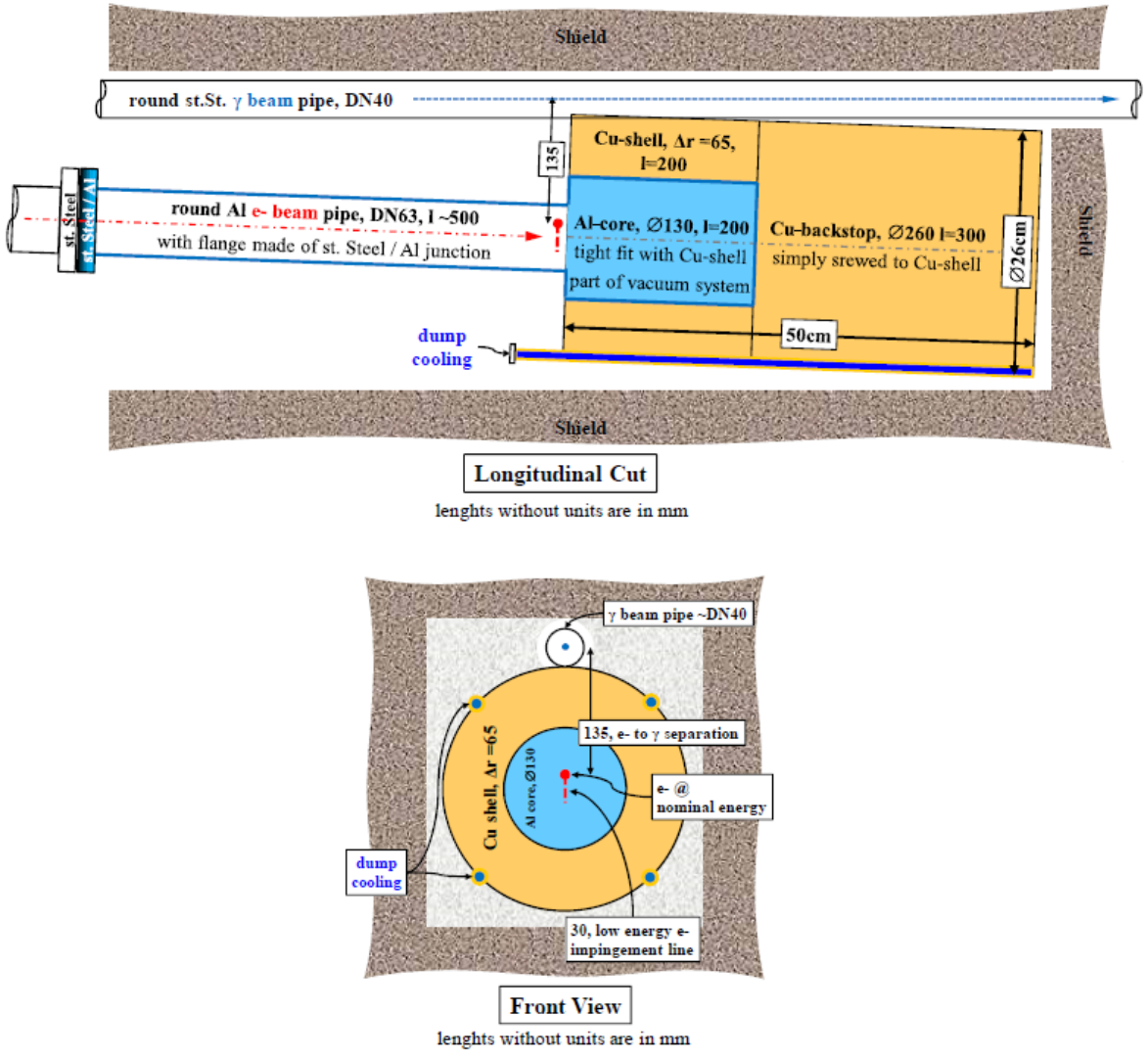
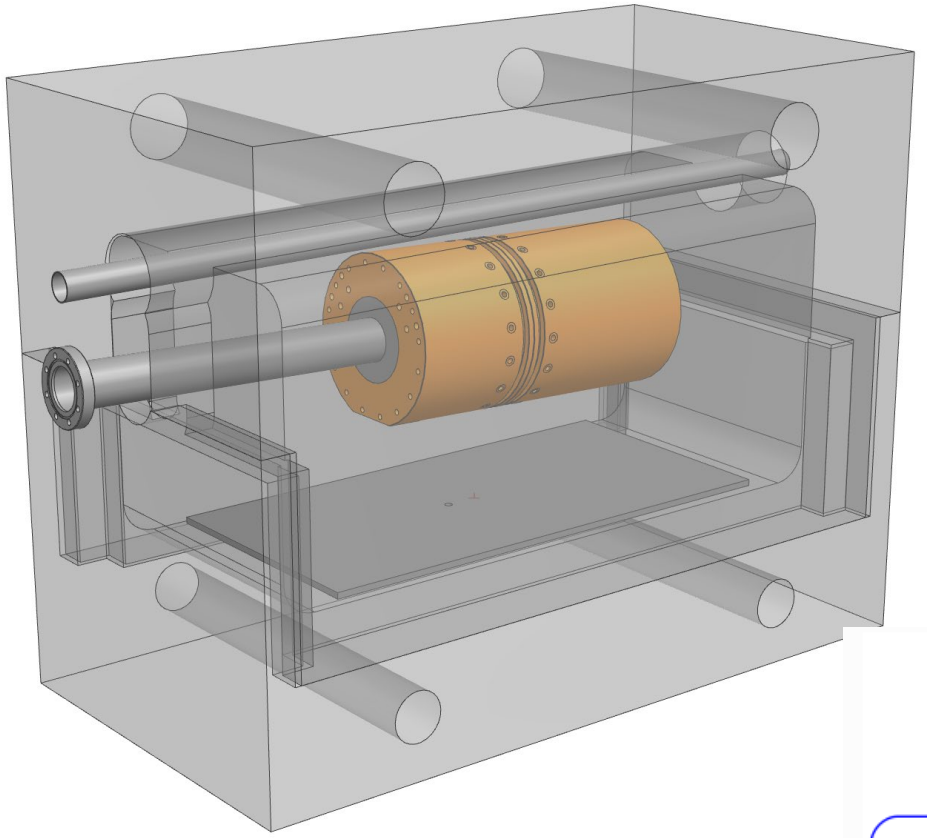
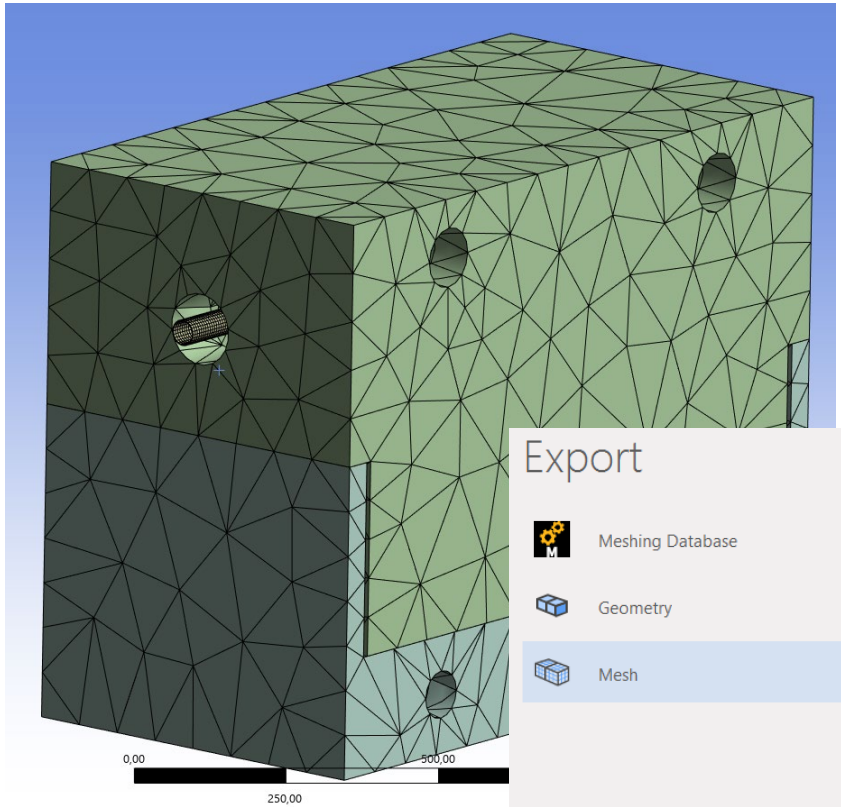


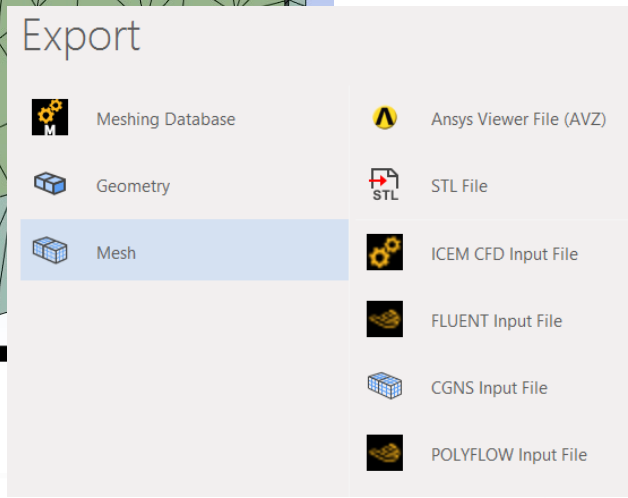
Figure 6.1: *Schematical layout of the LUXE beam dump.*

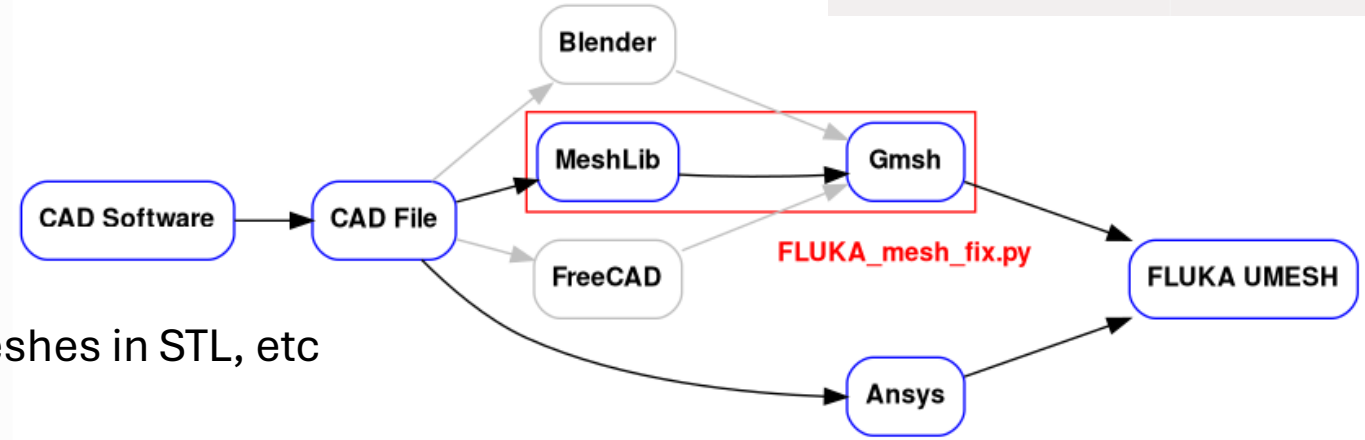
Electron beam dump, current status

- Simplified CAD design of dump and shield for simulations





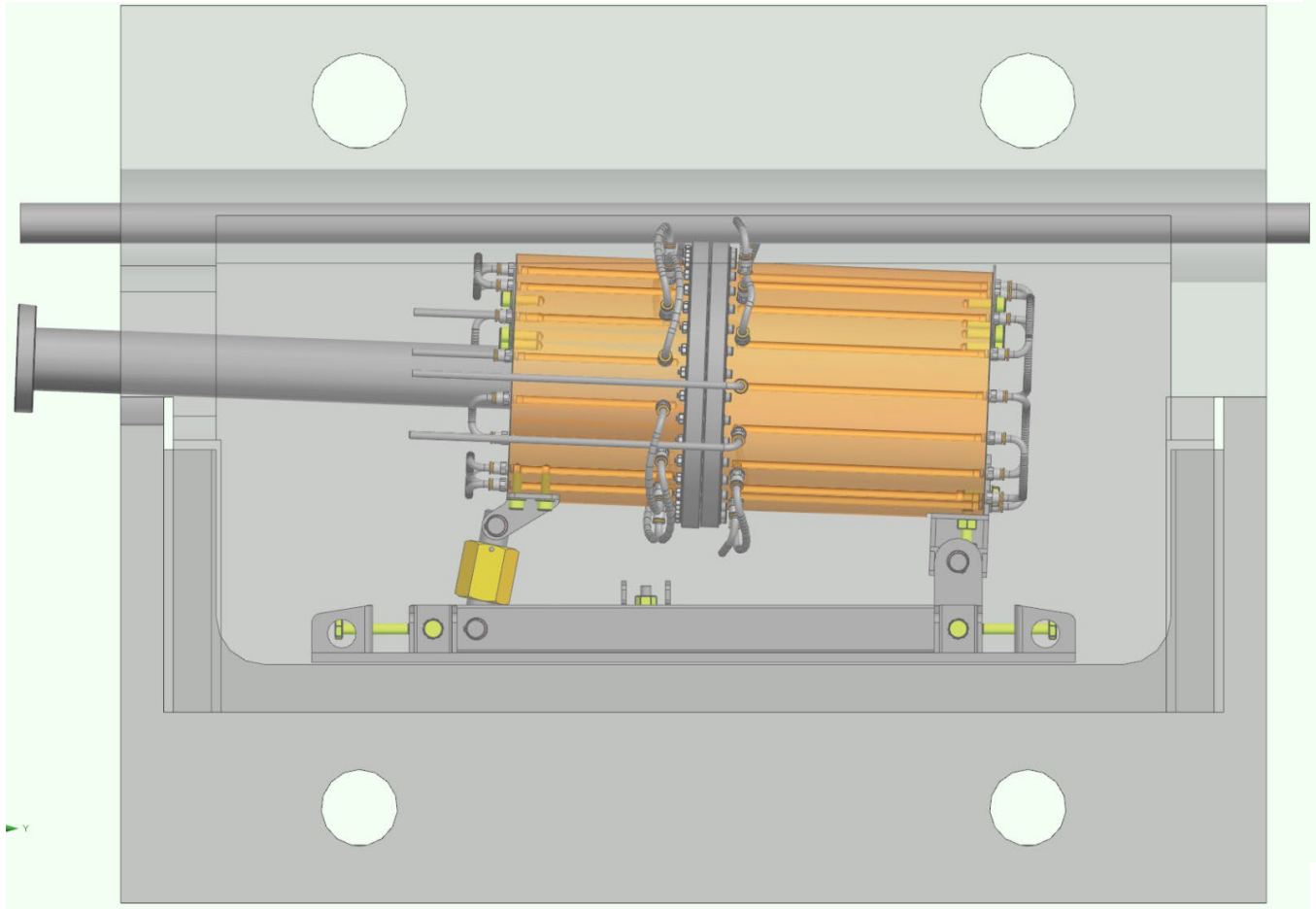


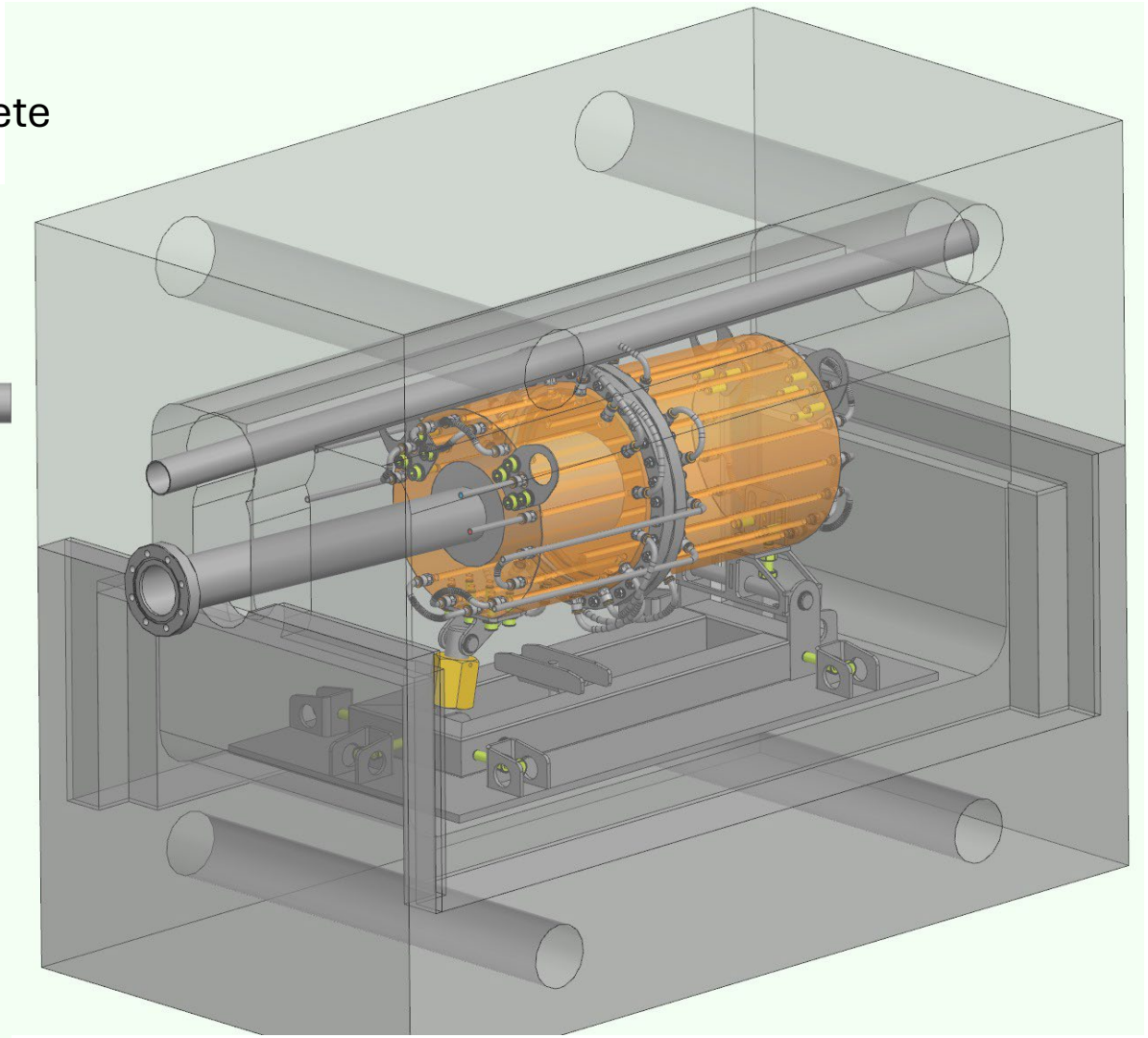


- Used to export geometry to Fluka
- Direct creation of geometry STEP files, or meshes in STL, etc
- https://fluka.cern/tools/umesh =>

Electron beam dump, current status

- Preliminary design of dump with cooling loops
- 3 points Isostatic adjustable supports ,
- Adjustable / tiltable and lockable base frame wrt concrete





Electron beam dump, preliminary FEA

- Preliminary FEA, 20 KW? heat load on full dump (10 KW on model),
- Length increased to 220 (Alu and Cu donut) and 320 mm (Cu dump)
- As very rough simulation, cooling ducts walls fixed at 30°C
- Heat load: 20/2 KW internally generated in the Φ10 x L 175 cylindrical volume,
- Copper ~400 W/mk, Aluminum according to table ~150 – 175 W/mK

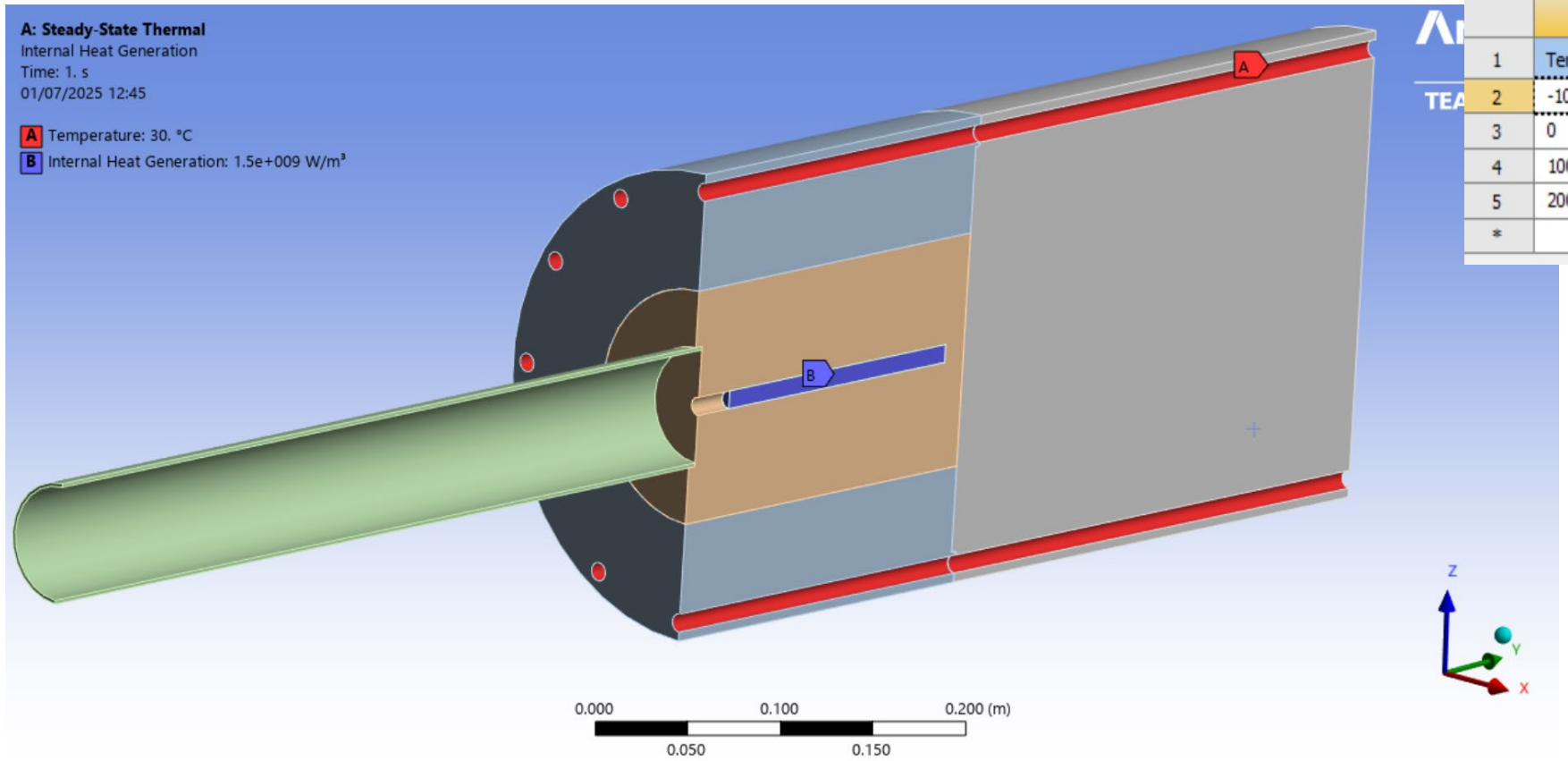
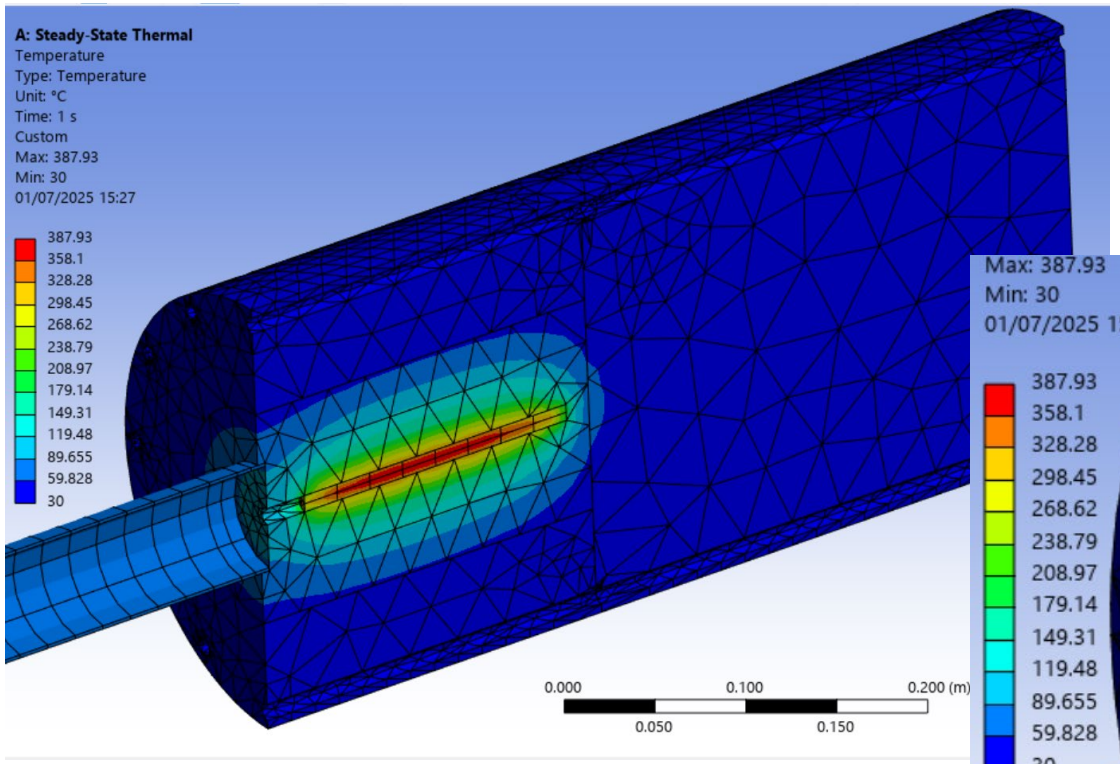


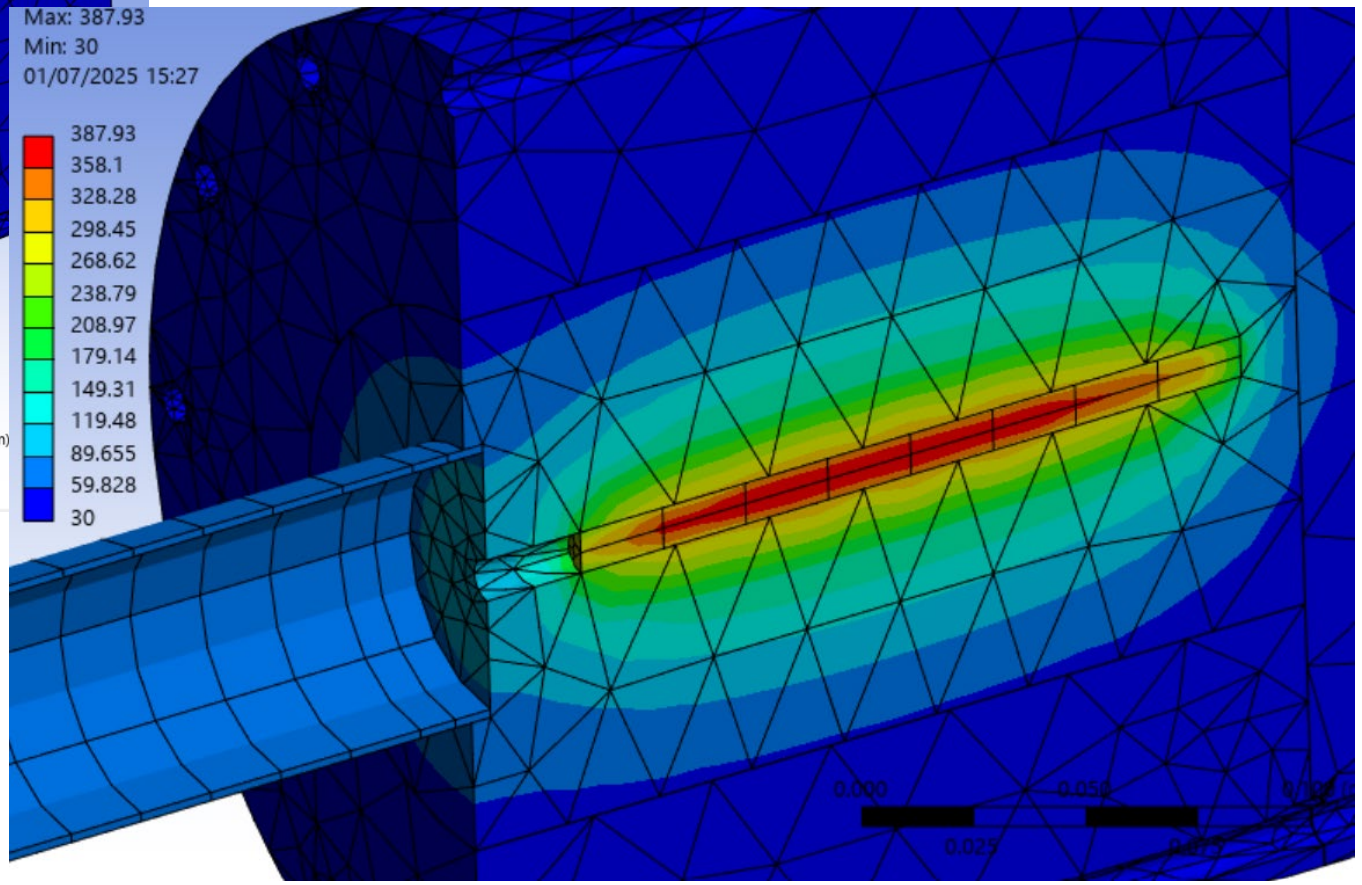
Table of Properties Row 20: Isotropic Thermal Conductivity

	A	B
1	Temperature (C)	Thermal Conductivity (W m^-1 C^-1)
2	-100	114
3	0	144
4	100	165
5	200	175
*		

Electron beam dump, preliminary FEA



- Reaching temperature ~390 ^C if heat develops on Φ10 mm x L 175 mm



- Depending on volume of heat generation?
- Temperature rise to quite high value
- Most of gradient in the aluminum core

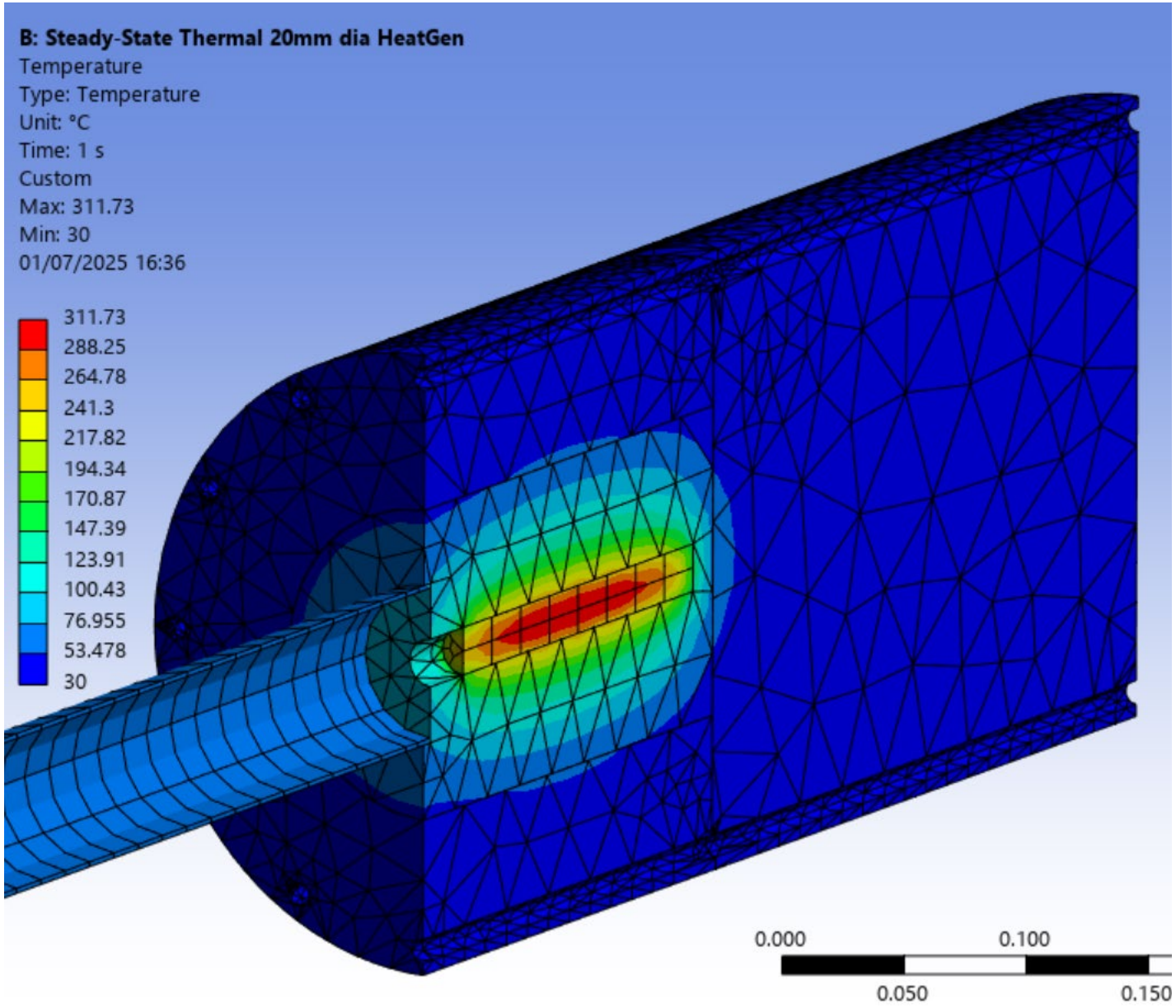
Electron beam dump, preliminary FEA

- Spreading heat generation to 4x larger volume (Φ20 mm x L 225 mm), temperature decreases … but not so much

- Partially depending on volume of heat generation

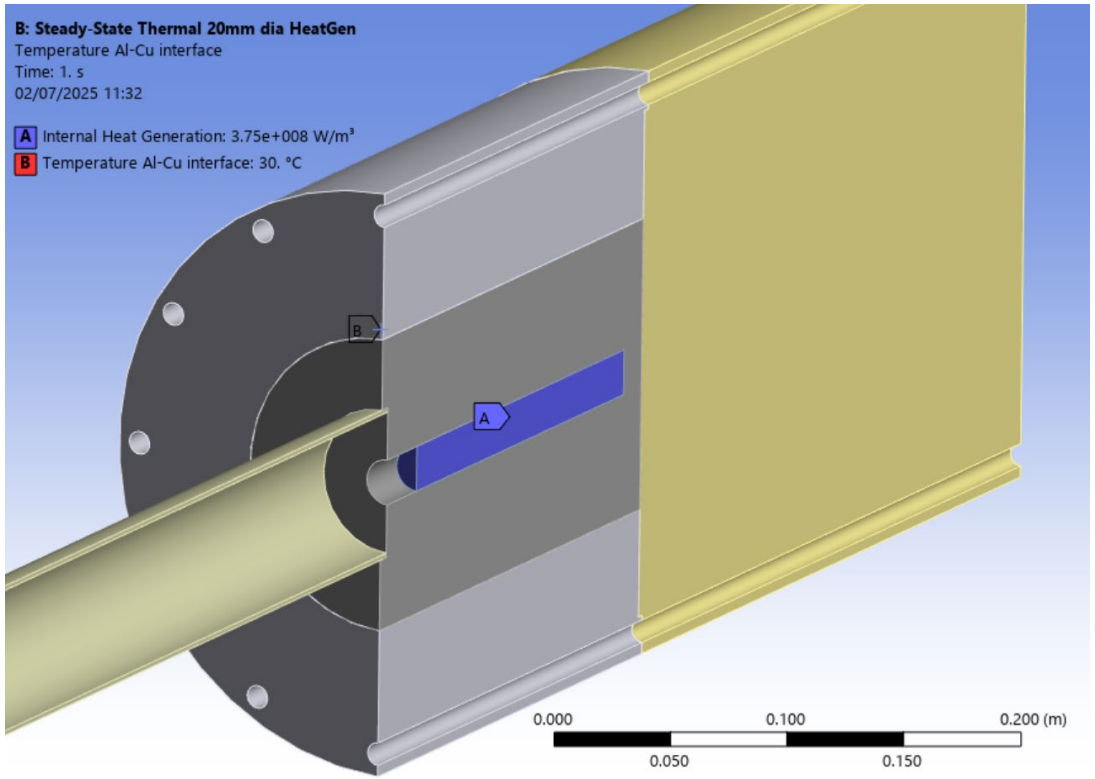
- temperature rise to quite high value

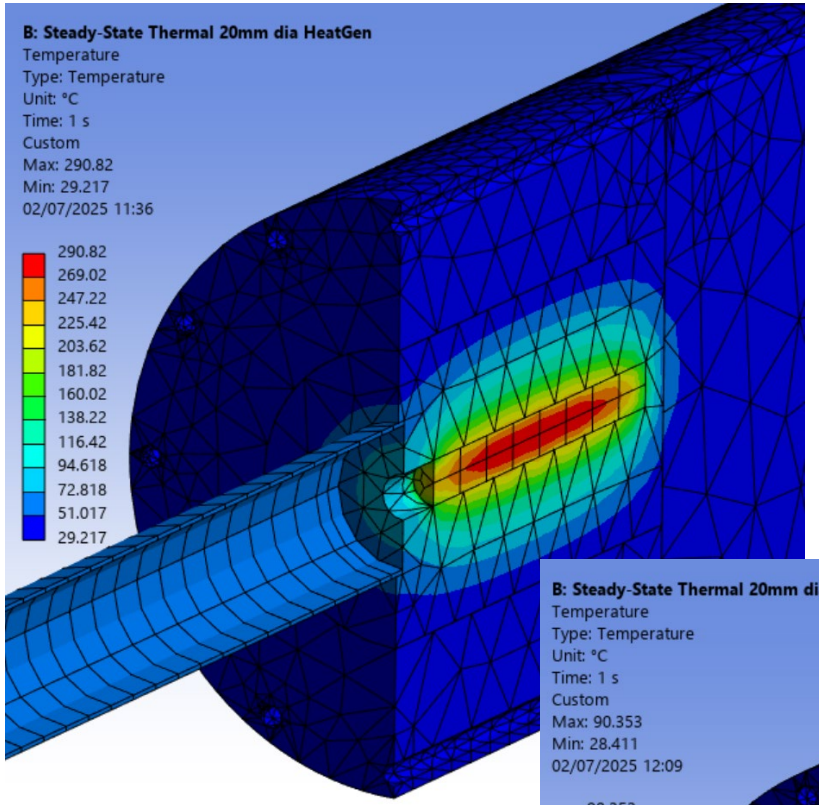
- Need to move cooling inside dump…?

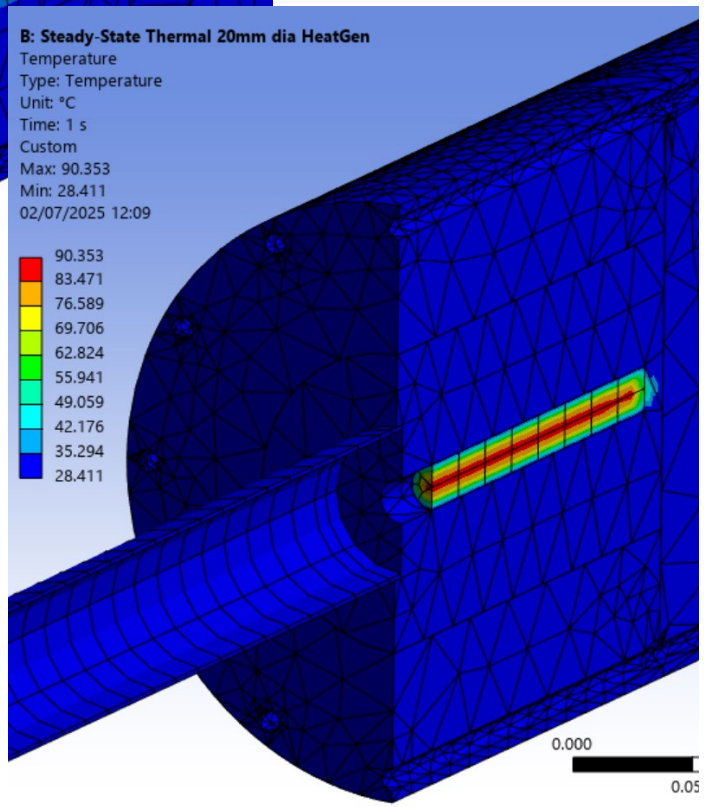


Electron beam dump, prelim. FEA

Need to move cooling inside dump…?
Exercise assuming to cool copper to aluminum interface







Only cooling on the boundary of the irradiated volume allows temperature < 100°C

Thanks !