Case study of conversion from CAD to SolidWorks and Paraview formats by CADfix

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- From Heating and Fuelling dept-related work
- Conversion of CAD to NUCODE input
- Specifically CATIA V5 to Paraview vtk format

CAD supplied by Drawing Office

ITER duct geometry 5.5 m $\times$ 1.6 m exterior.

- Two part CATIA assembly- liner shield and liner (including pipework)
- Shield - 26.8 Mbyte geometry database file with 28 bodies
- Liner - 32.3 Mbyte file with 260 bodies
- 10 732 surfaces and 25 281 lines or edges

CAD conversion to SolidWorks

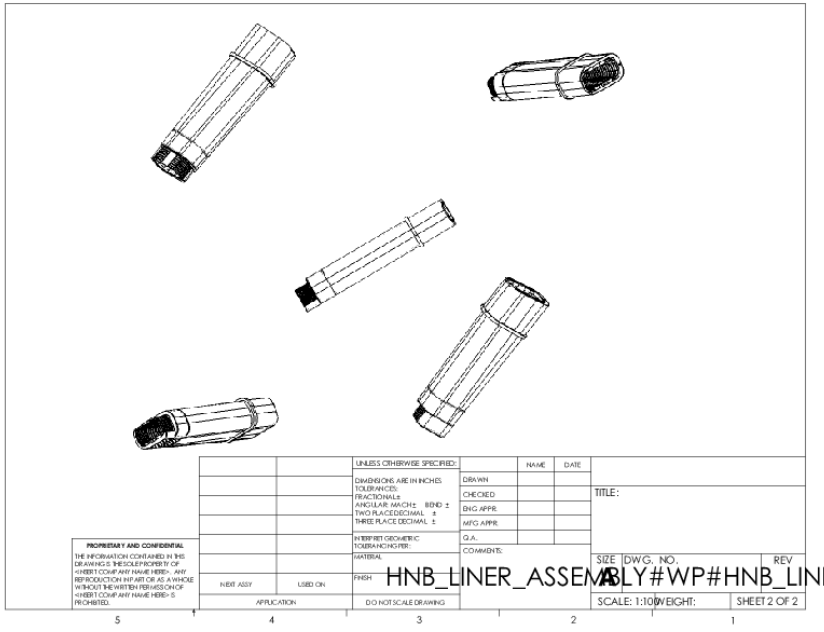
- Read by CADfix 7.0 and exported in STEP format for Solidworks 2006, successfully read by Solidworks 2007.

- No user intervention.

Duct geometry

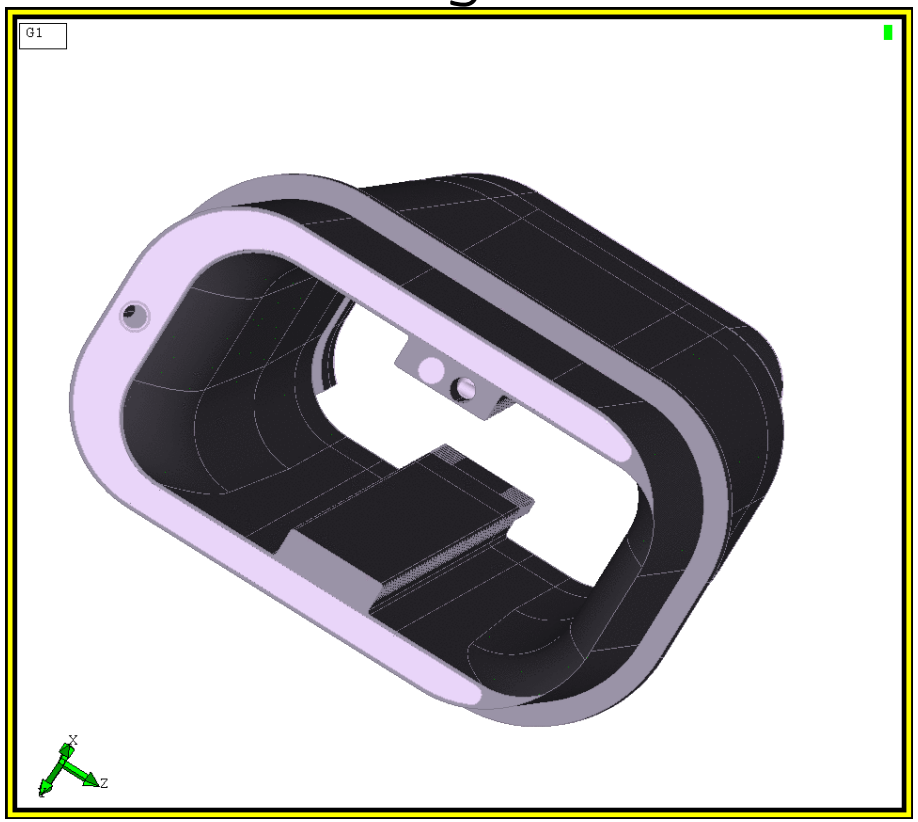
Entrance to duct

Drawings of duct CAD

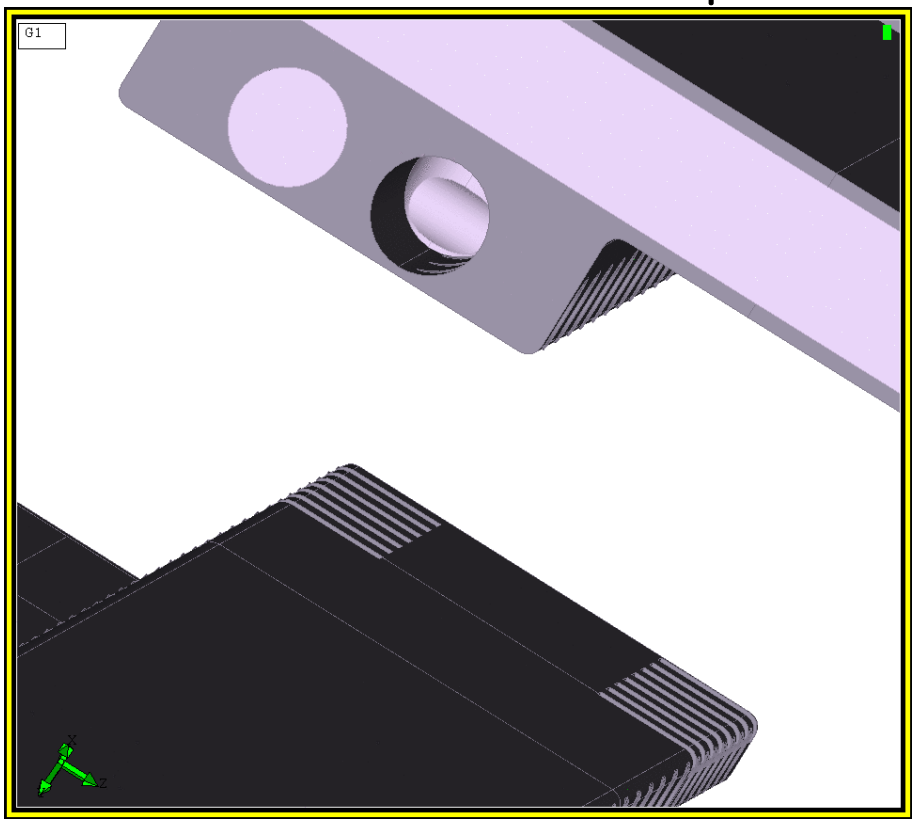


CADfix 7.0 images of shield

Shield showing exit to torus

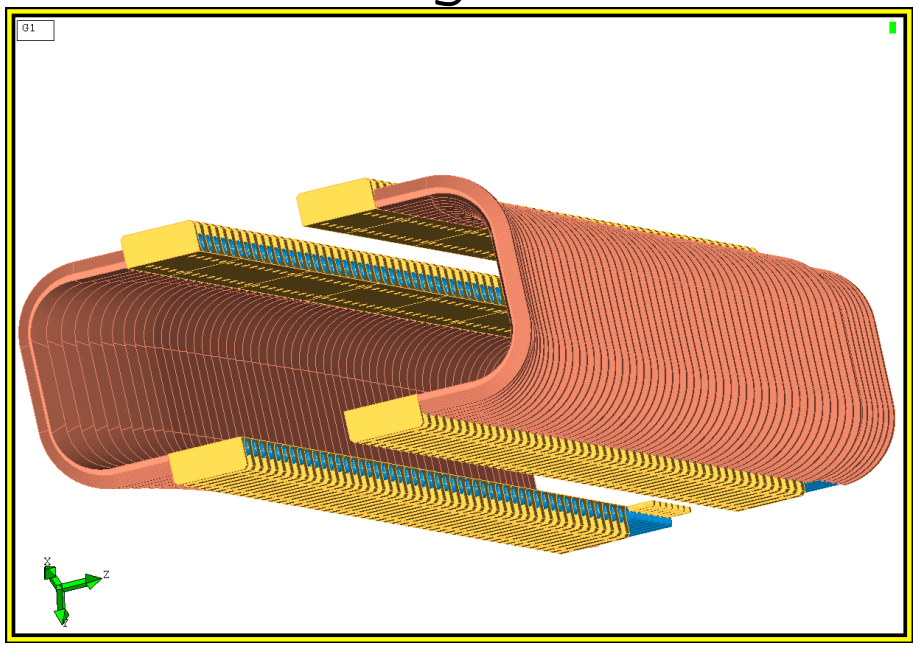


Shield in close-up

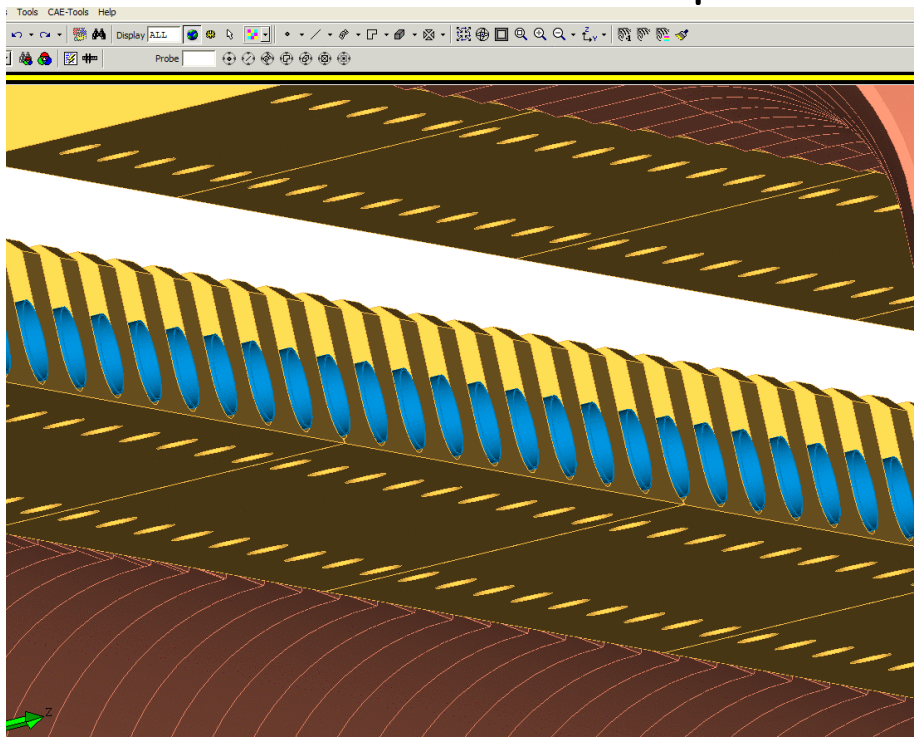


CADfix 7.0 images of liner

Liner showing exit to torus

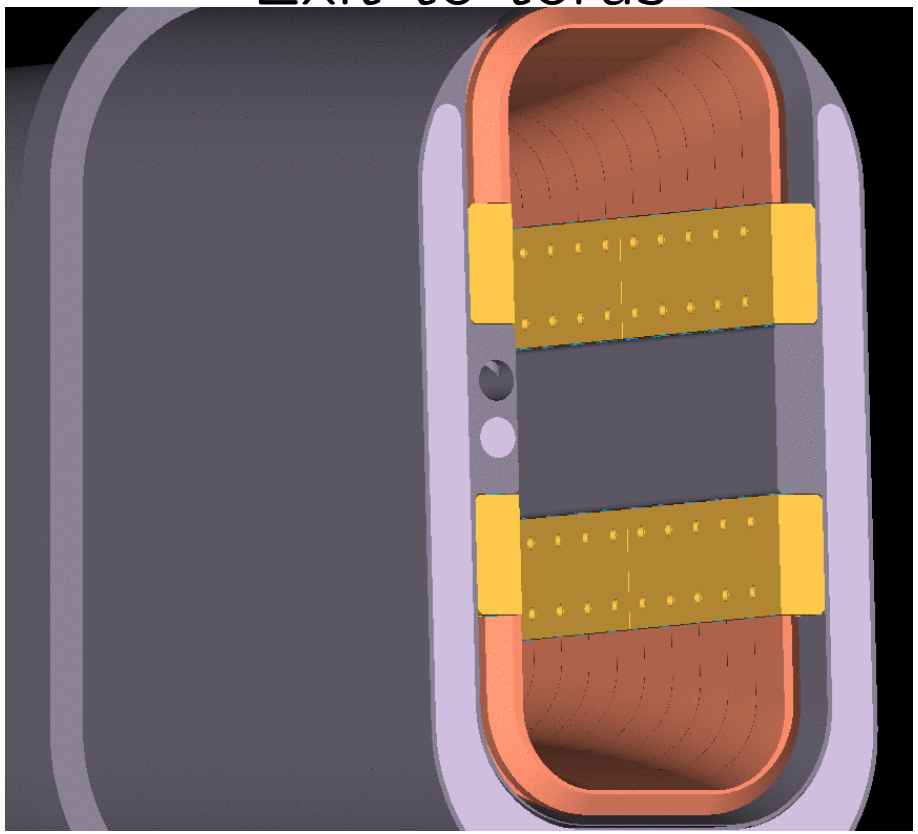


Liner in close-up

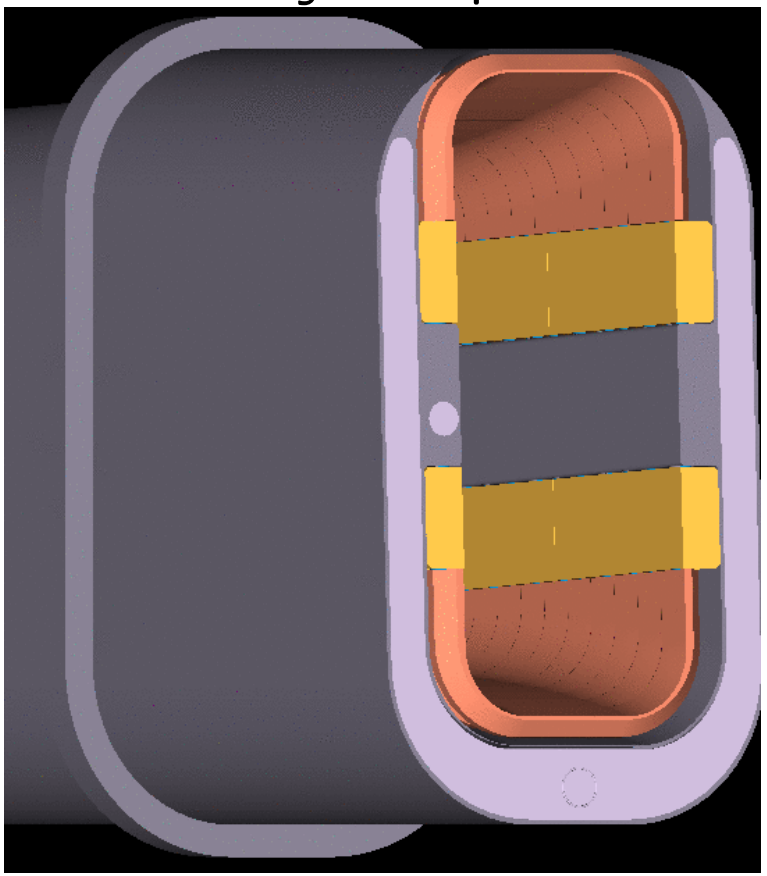


CADfix 7.0 images of duct assembly

Exit to torus



Automatically simplified model

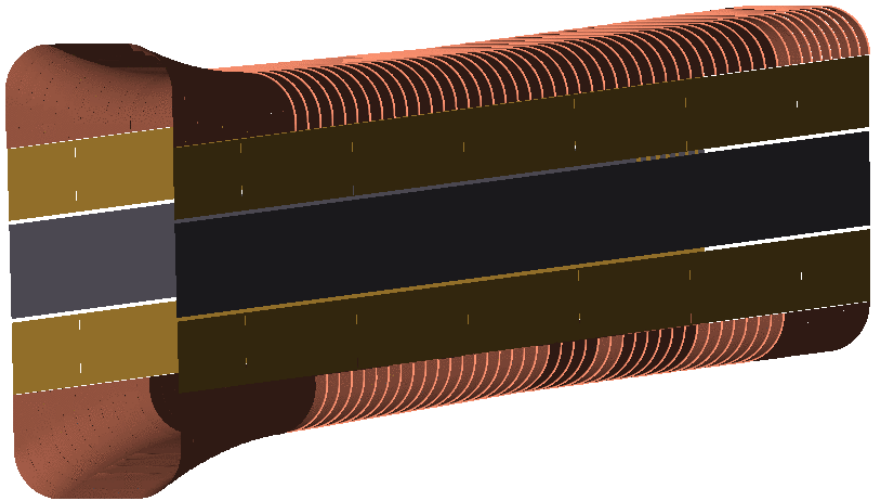


First attempt at duct model

Initial CAD conversions

- Hole removal requested
- 1 652 surfaces as candidates for merging, 1 572 merged
- Innermost surfaces then formed into set containing 446 surfaces and 1583 curves
- *But* 56 pipe-widths along duct. Long, thin features.

Liner based model



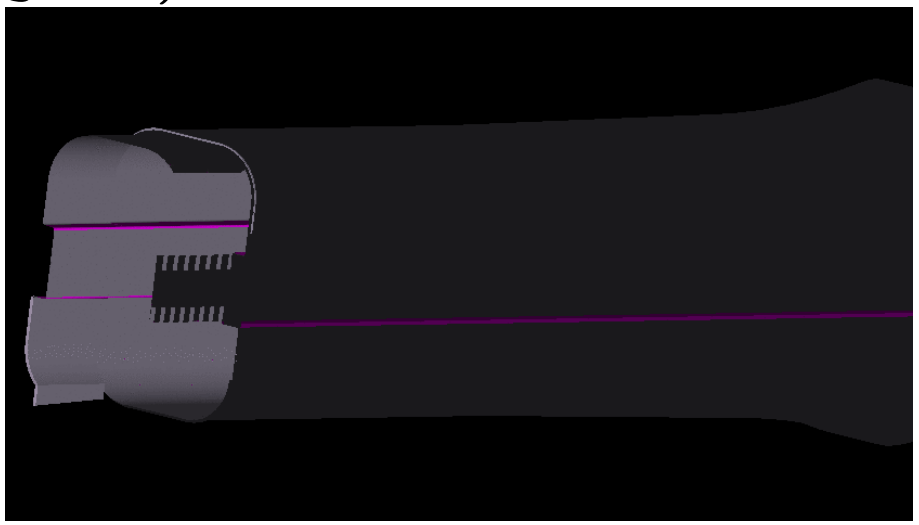
Second attempt at duct model

CAD manipulations

- New model - liner surfaces surrounded by shield surfaces.
- Process shield and liner separately - shield surfaces extracted
- Difficult surfaces replaced by hand
- Most surfaces joined automatically

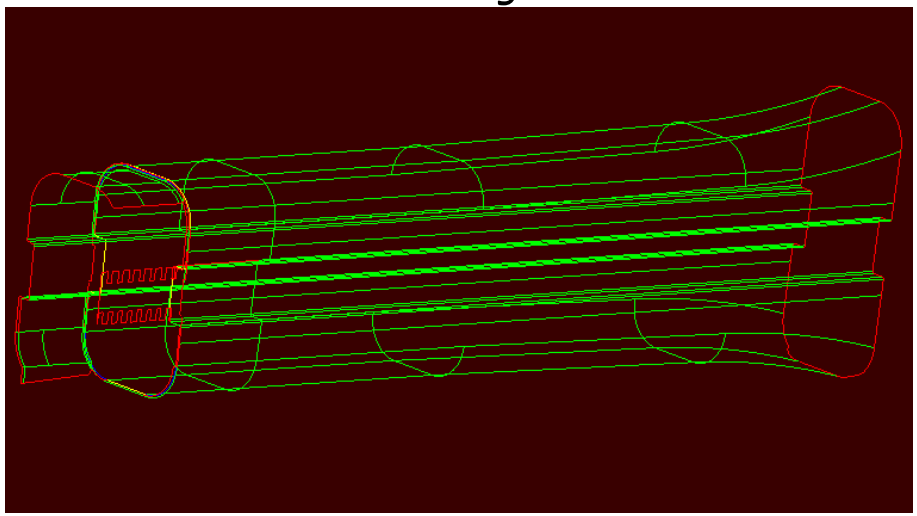
Shield as surfaces

(Replaced surfaces appear in magenta)

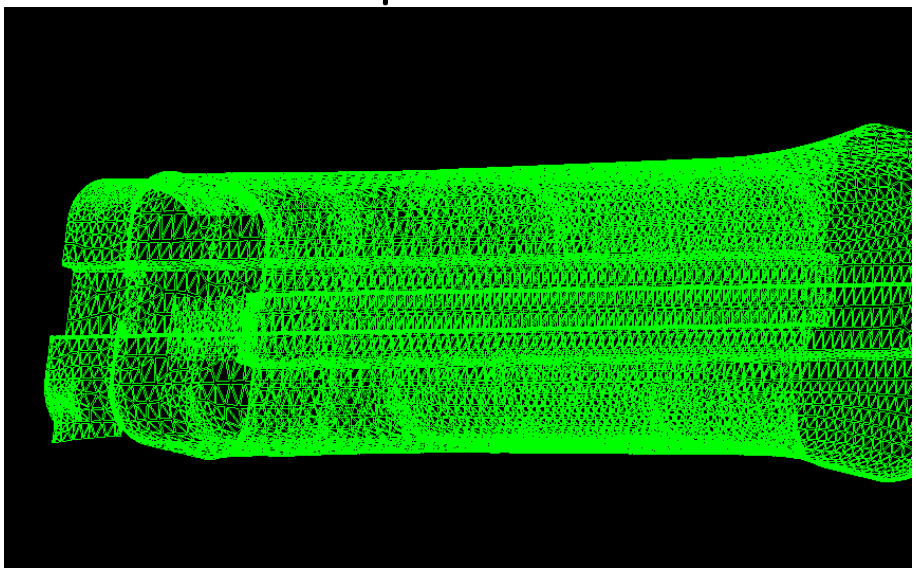


Shield as surfaces

Connectivity of lines

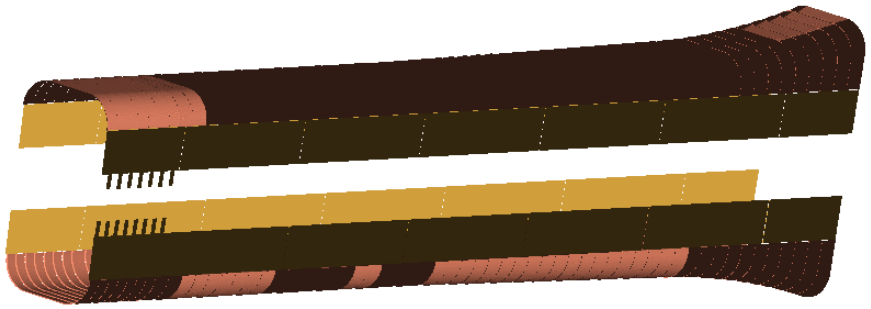


Simple mesh

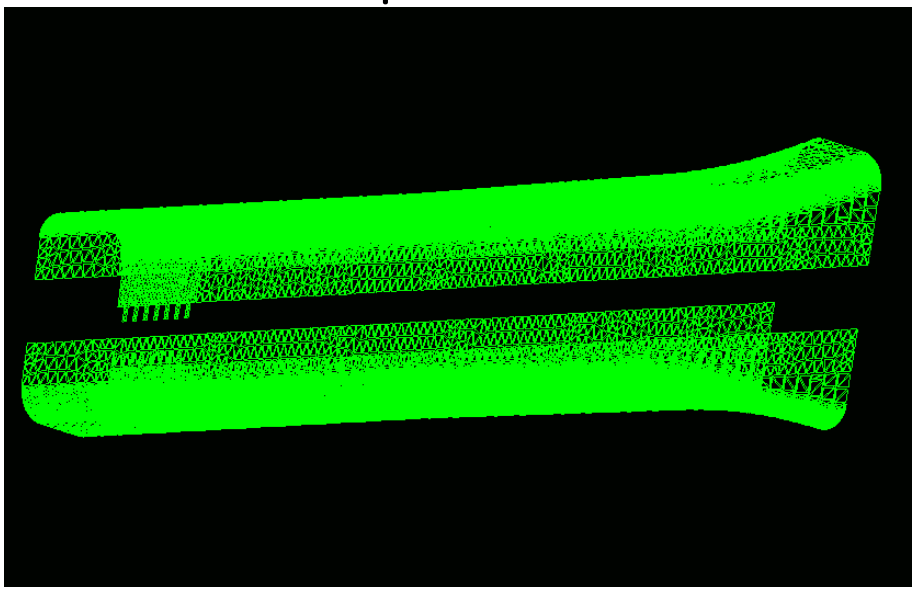


Liner as surfaces

Shaded surfaces

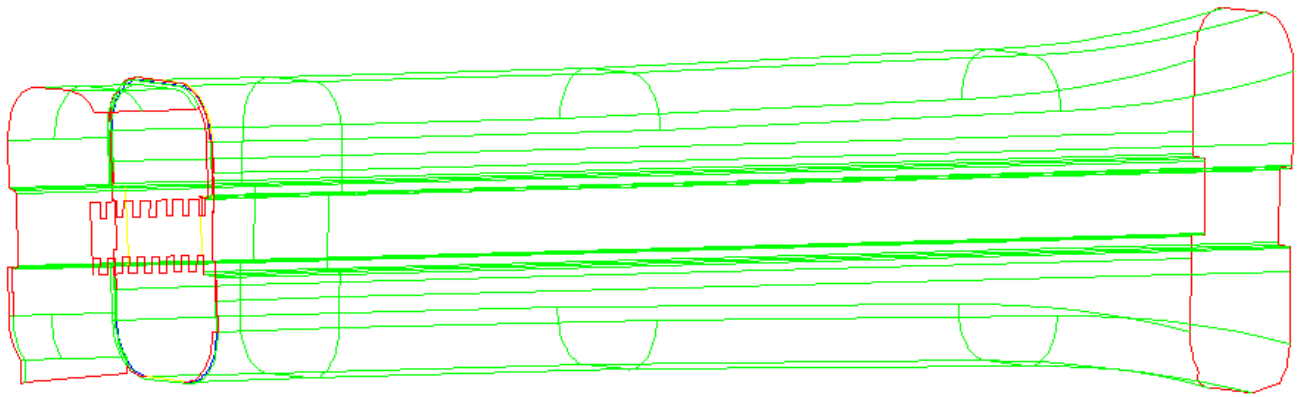


Simple mesh



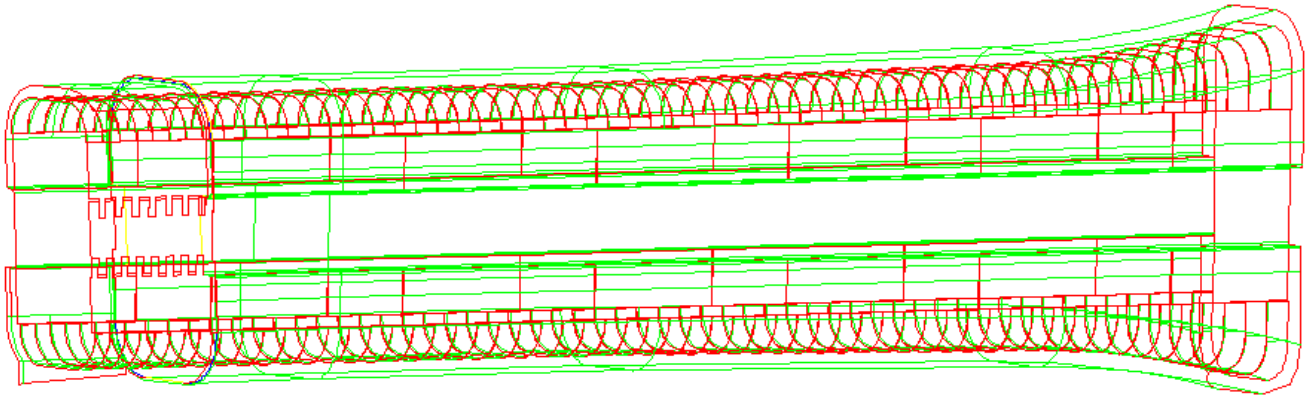
Shield as surfaces, showing connectivity

Two surfaces now properly joined



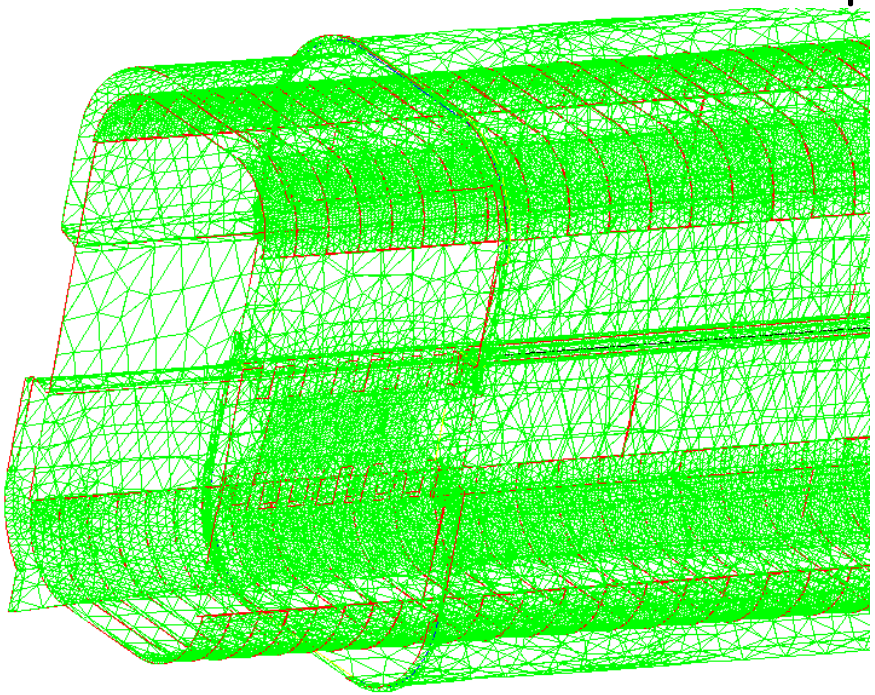
Assembly as surfaces, showing connectivity

553 surfaces made with 1877 curves

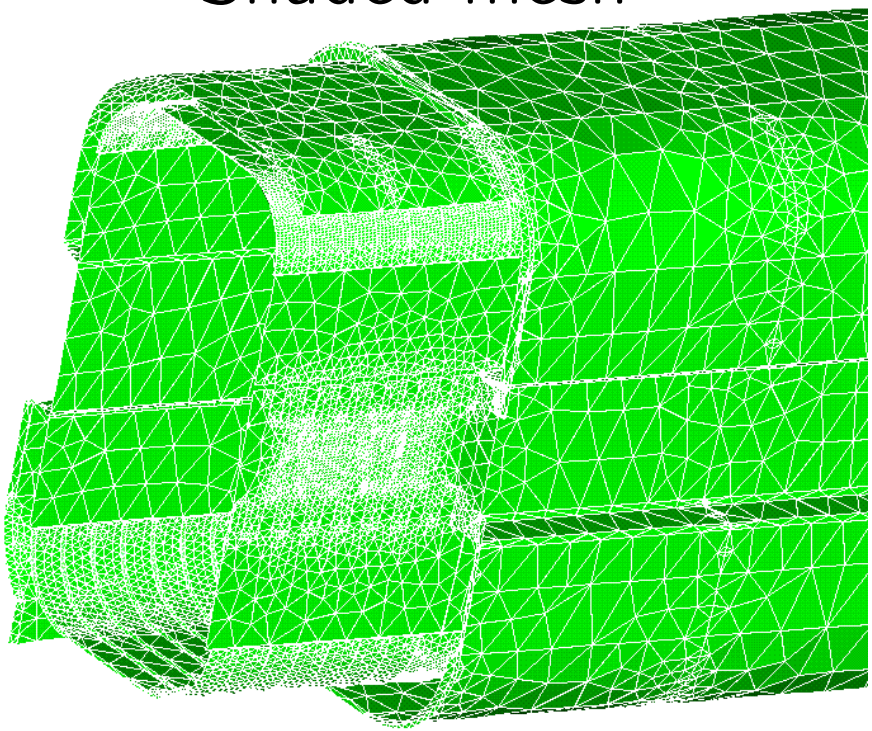


Assembly - 95 000 triangle mesh

Entrance to duct in close-up



Shaded mesh

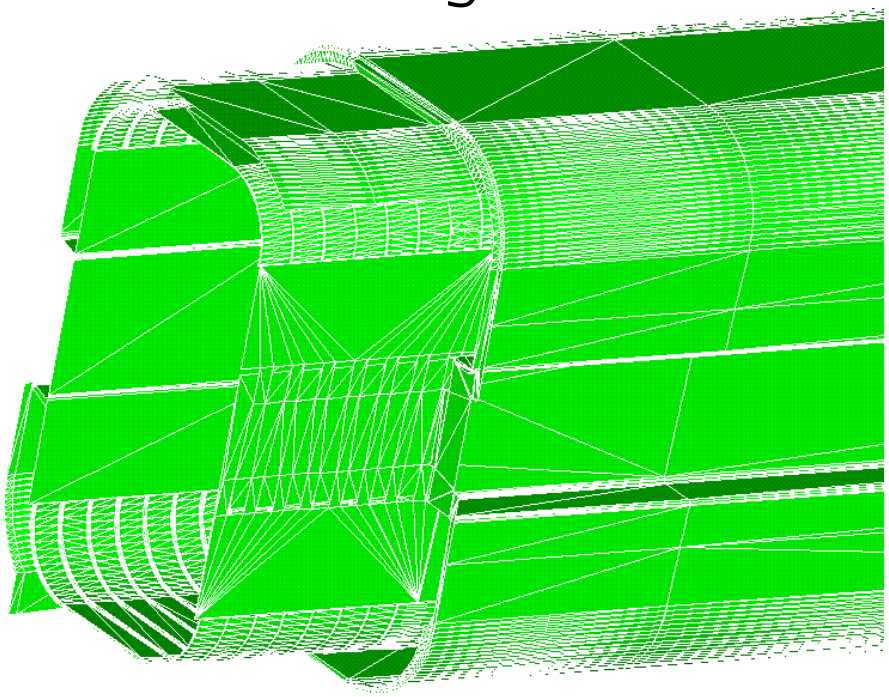


Assembly - meshing experiments

CAD manipulations

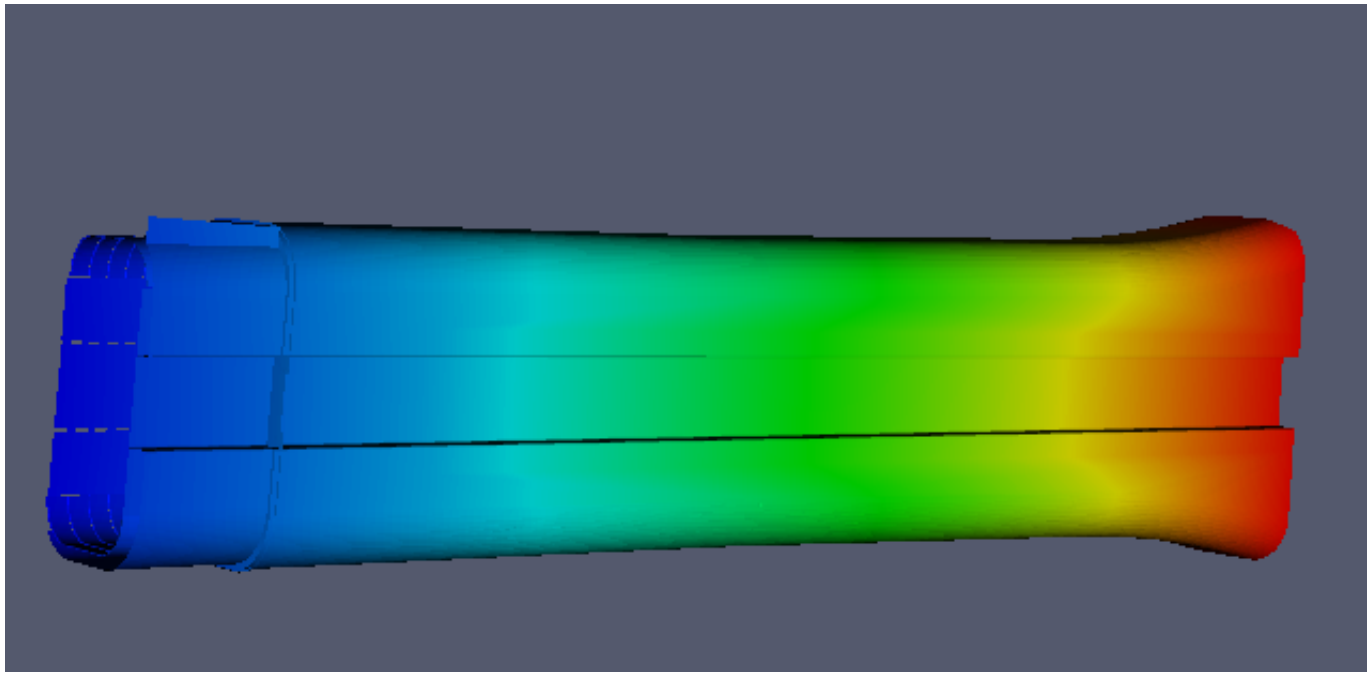
- Simple mesh used DELM/Mapped option
- Advanced meshing option - chord sag parameter
- Maximum edge size of 100 mm
- DELC option

45 000 triangle mesh



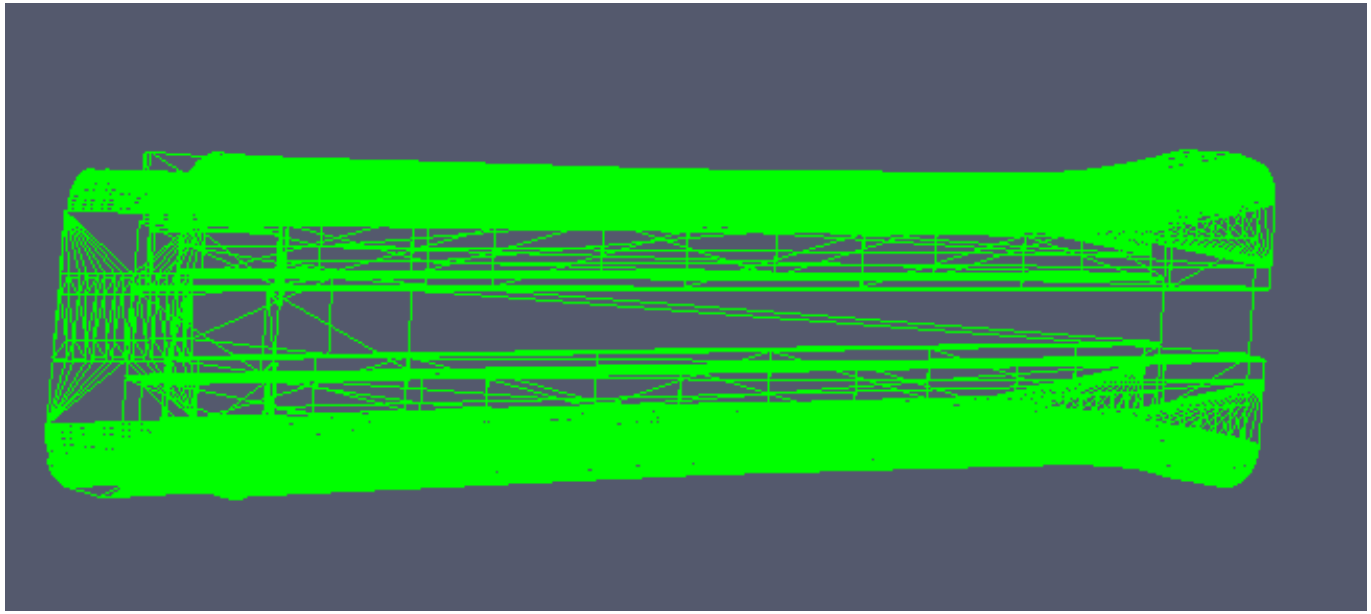
Paraview image of duct

Surfaces colour shaded with dummy data



Paraview image of duct

45 000 triangle meshing



Conclusion - for Neutronics

- CADfix as viable option to defeature CATIA and export to SolidWorks. Application to Attila.

- Experiments with meshing valuable for underlying research.

- Demonstration of locally written software to convert CADfix database to different format (vtk in this instance, but could be MCNP-input)