

From folded sheet to finite elements

An actual nonlinear self-contact model of the FABETS sheet component.

225,232

nodes in the completed model

317,051

shell elements

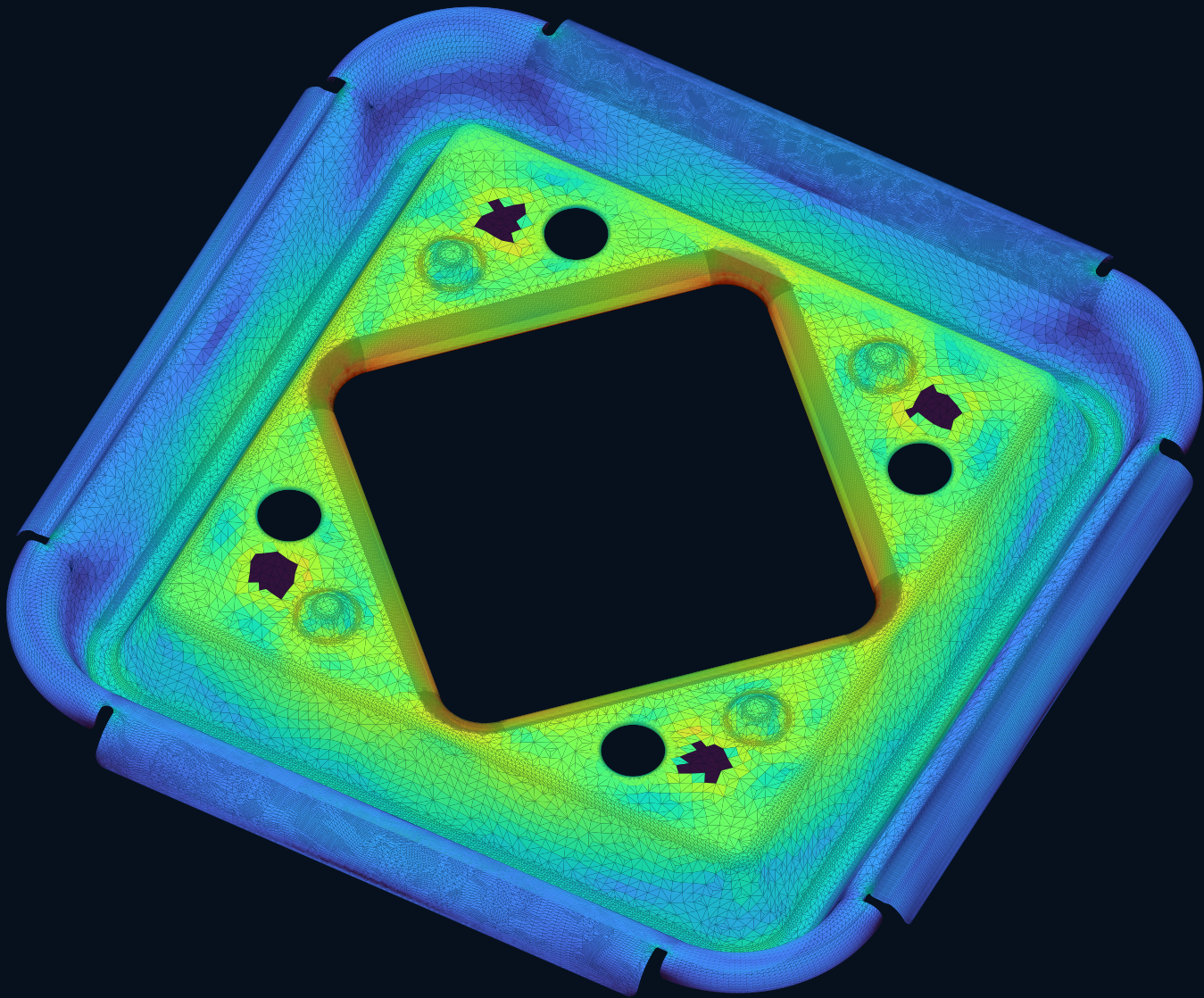
0.30 mm

nominal sheet thickness

33.22 MPa

peak von Mises stress / case XM

Geometry shown at true scale.
Colour is stress, not deformation.



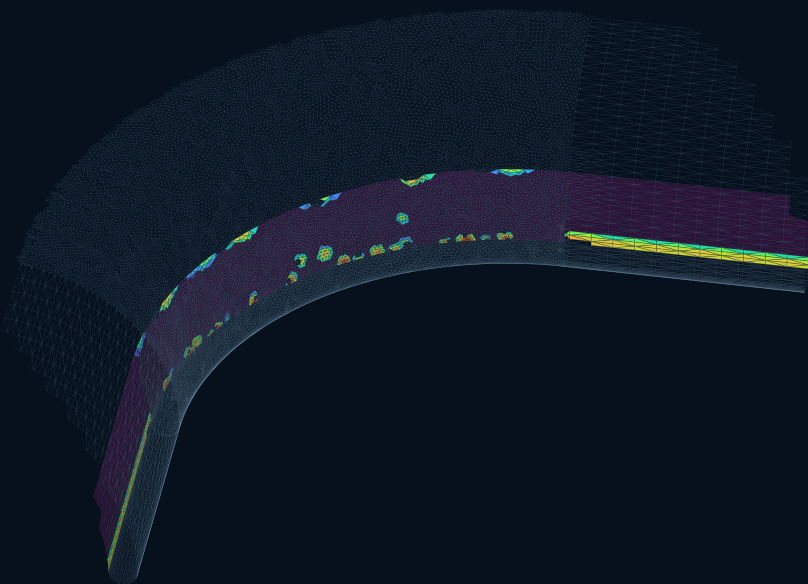
VON MISES STRESS / MPa / LOG SCALE / COLOUR FLOOR: 0.001



Contact, under the microscope

Two contact-role assignments on the same model. Identical crop, camera and colour scale.

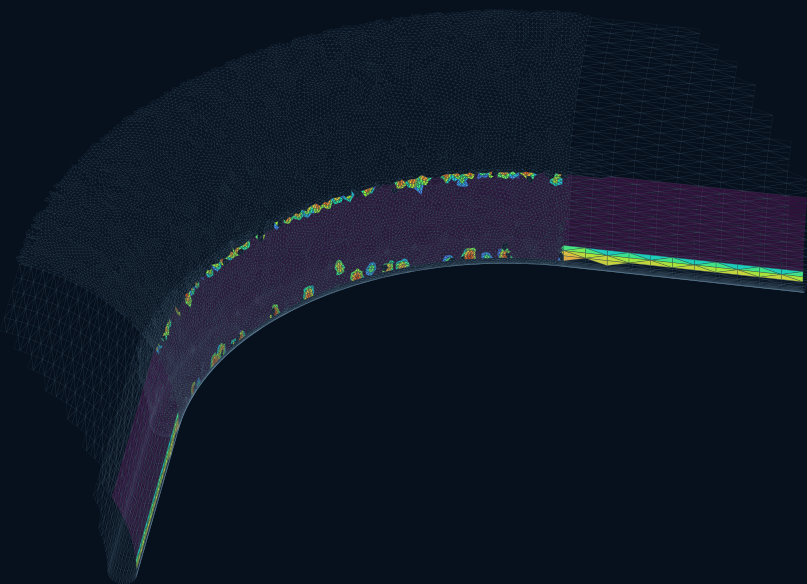
ROLE XM



9.73 N

resultant on the same physical surface

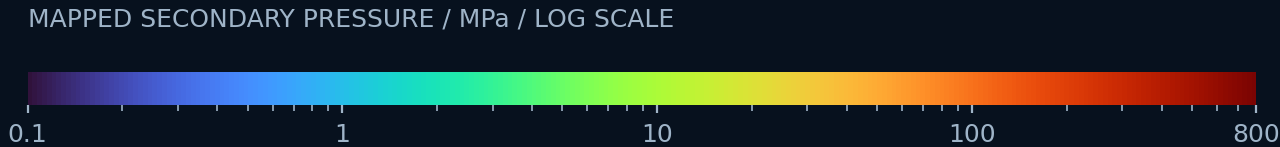
ROLE YM



11.22 N

resultant on the same physical surface

Lowest colour band: 0-0.1 MPa
Grey wireframe: surrounding geometry



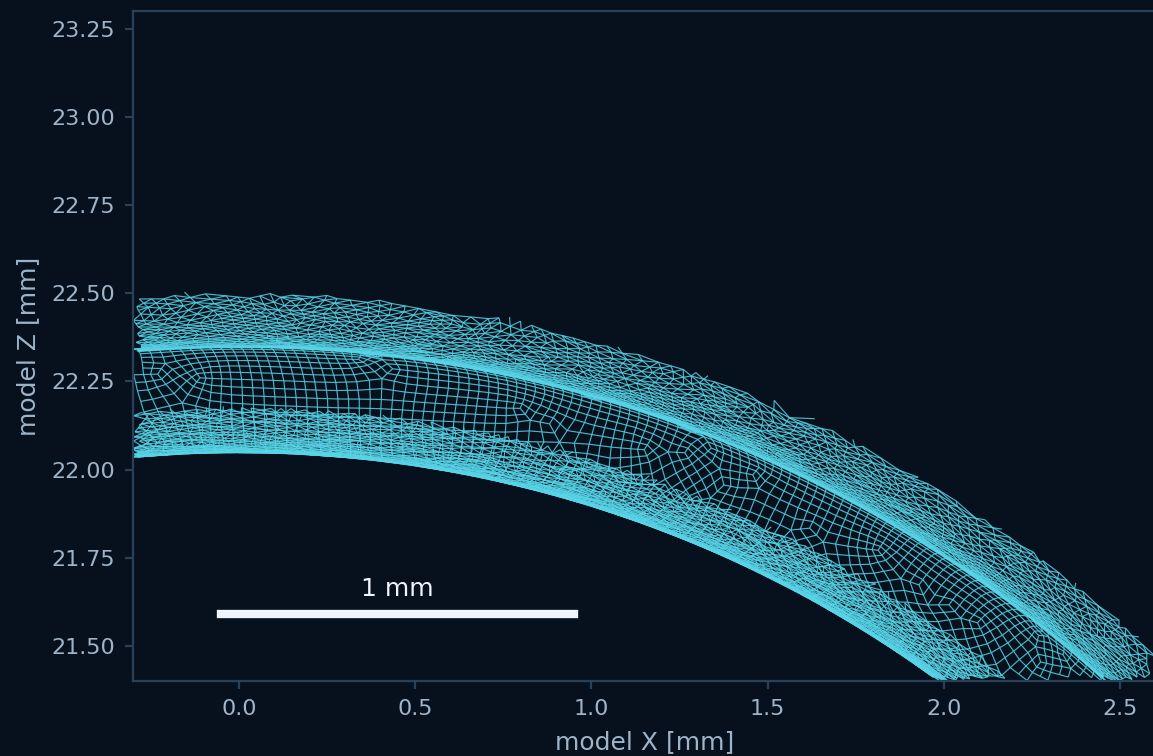
17.2% force-vector change
Contact-role sensitivity remains.

More detail where contact happens

The same hem detail at the same scale. Original mesh edges are shown; no decorative tessellation.

V09zm

COMPLETED NATIVE RUN

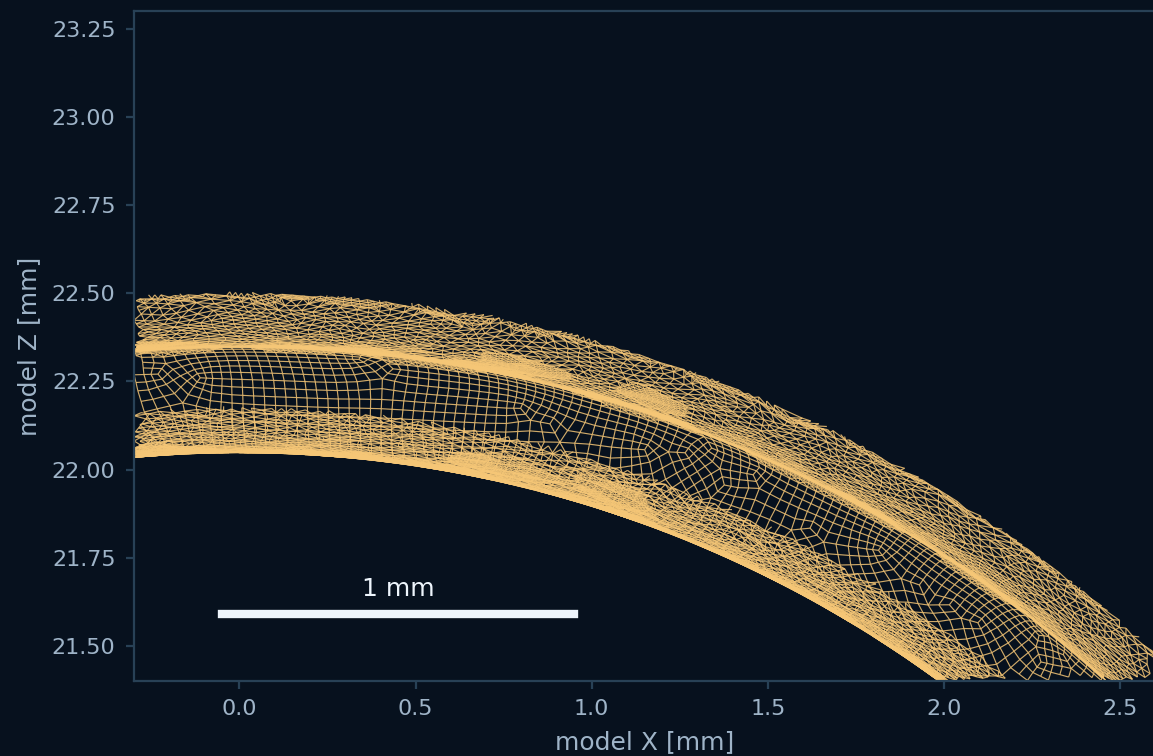


225,232 nodes

317,051 shell elements

V09zq

PREPARED MESH / SOLVE STOPPED



291,988 nodes

429,327 shell elements

Local refinement follows the contact zones found in V09zm. Geometry and contact parameters were retained.

A research pathway to a validated one-metre beam

October 2026 / Native component studies, current limitations and the next compute step

WHAT THE MODEL INVESTIGATES

FABETS is developing reversible sheet-metal building modules for repeated assembly, adaptation and reuse. The current study isolates component B and its tightly folded central-opening hem.

Two nonlinear static S2S self-contact cases (XM and YM) completed in OptiStruct 2025.1. Main and secondary contact surfaces exchange roles. There is no external service load.

COMPLETED V09zm RESULTS

Metric	XM	YM
Resultant on physical surface 2018	9.73 N	11.22 N
Maximum model displacement	0.31484 um	0.33997 um
Maximum von Mises stress	33.21575 MPa	31.65054 MPa

Native completion, equilibrium and exported fields were checked. The two force vectors differ by 17.2%. Mesh and contact-role sensitivity remain; numerical completion does not establish structural capacity.

The images show actual mesh and native result data. Stress is the maximum of the two shell-face records; no nodal stress smoothing was applied. Pressure is a mapped interface quantity and must not be interpreted as a material-strength rating.

CURRENT COMPUTE BOTTLENECK

The adaptive V09zq mesh contains 291,988 nodes and 429,327 elements. Its XM run stopped after 7 min 7 s during contact preparation on the 96 GB PC. YM was skipped; no new solution fields exist.

The native log records a failed 122,636 MB dynamic-array allocation and CONSLI contact-search memory error 5903. The eventual full-run memory peak remains unknown.

SUPPORT THAT WOULD ADVANCE THE WORK

A short, authorised OptiStruct/HPC evaluation on a high-memory node, starting at **512 GB RAM** with a 1 TB option, would let us measure the actual demand and review contact-search behaviour. This is a trial specification, not a completion guarantee.

OptiStruct 2026 is installed locally but has not yet been validated on this model. The current local licence is Student Edition; external or cloud execution entitlement would need to be arranged.

VALIDATION STILL AHEAD

Contact and mesh sensitivity; tight-hem shell assumptions and element quality; measured geometry and assembly behaviour; component coupling; then a physically validated one-metre beam case. The present study does not establish real assembly preload.