

Updates on FE Deformation Studies

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Summary of TUPO Meeting

- Standard Design with long strips
 - At -35°C operating temperature:
 - $\approx 400\text{ }\mu\text{m}$ („free“ module)
 - $\approx 340\text{ }\mu\text{m}$ („mounted“ module)
 - Real deformation is somewhere inbetween
 - At -25°C operating temperature:
 - $\approx 330\text{ }\mu\text{m}$ („free“ module)
 - $\approx 280\text{ }\mu\text{m}$ („mounted“ module)
- Standard Design with long strips
 - Deformation of sensor:
 - $\approx 410\text{ }\mu\text{m}$ (@ -35°C)
 - $\approx 350\text{ }\mu\text{m}$ (@ -25°C)
- Reason for unacceptable large deformation
 - Difference in CTE between CFRP and Hybrid (G10)
 - ▶ $\approx -1.0\text{ ppm}$ vs. $\approx 12.0\text{ ppm}$
 - Equal thickness of support bridge and Hybrid
- Apparently new PCB substrates available with tunable CTE

Updates on Long Contact Design with long Strips

- Previous results obtained excluding chips

I-DEAS Visualizer

Display 1

Fem2

B.C. 1,DISPLACEMENT_1,RESTRAINT SET 1

S:\services\CAD\Ideas\home\mussgl\I-DEAS\LongContactSingle.mf1

DISPLACEMENT Z Unaveraged Top shell

Min: -0.000 mm Max: 0.180 mm

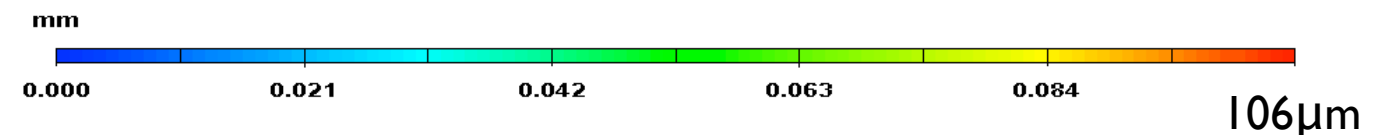
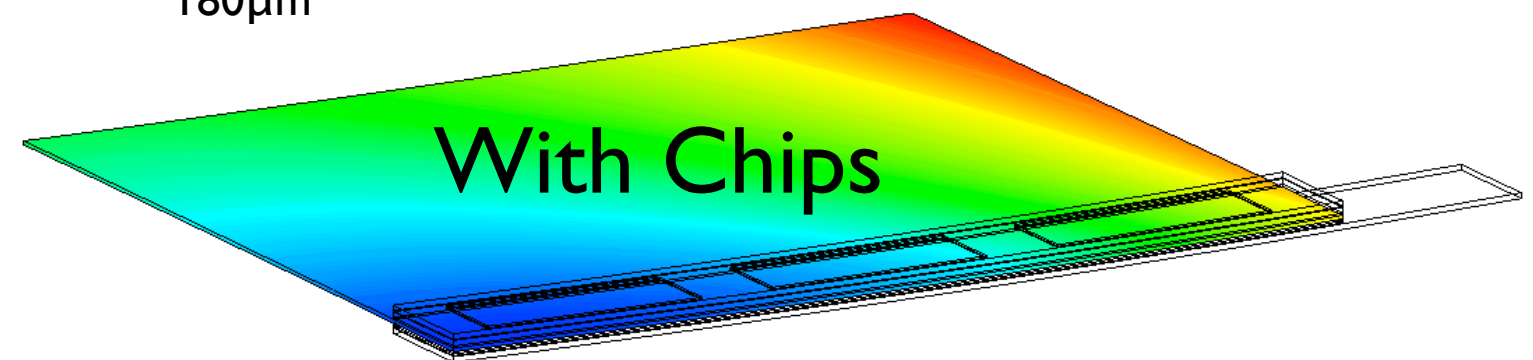
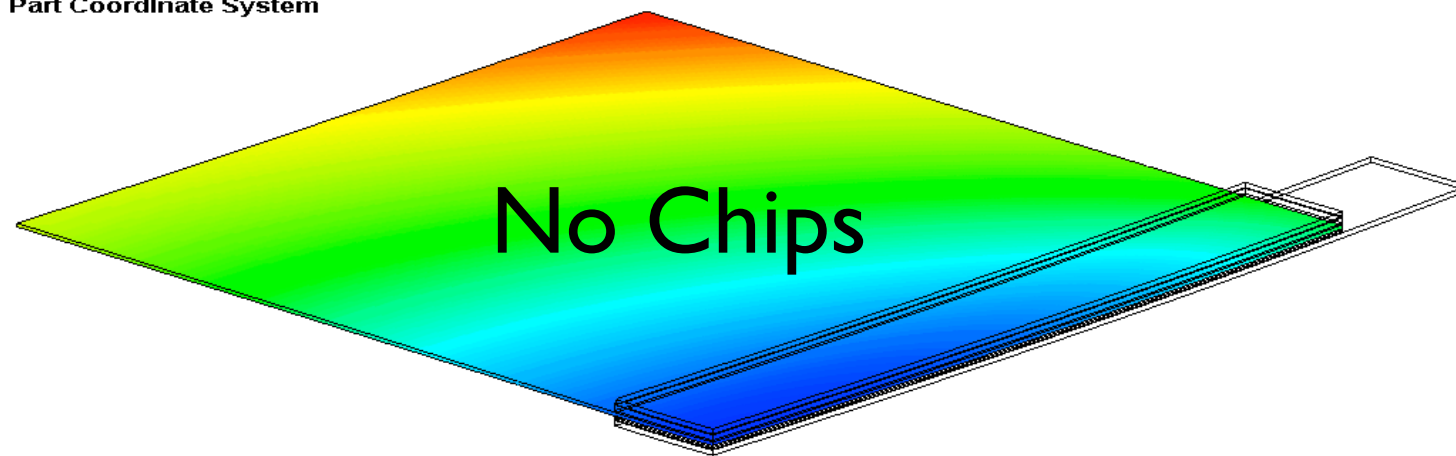
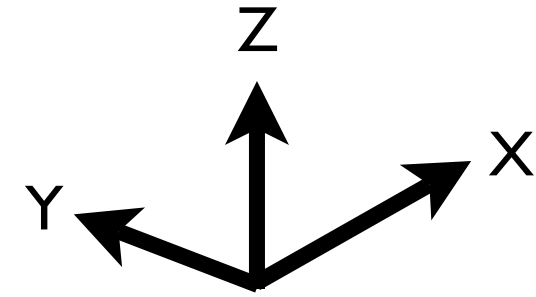
B.C. 1,DISPLACEMENT_1,RESTRAINT SET 1

S:\services\CAD\Ideas\home\mussgl\I-DEAS\LongContactSingle.mf1

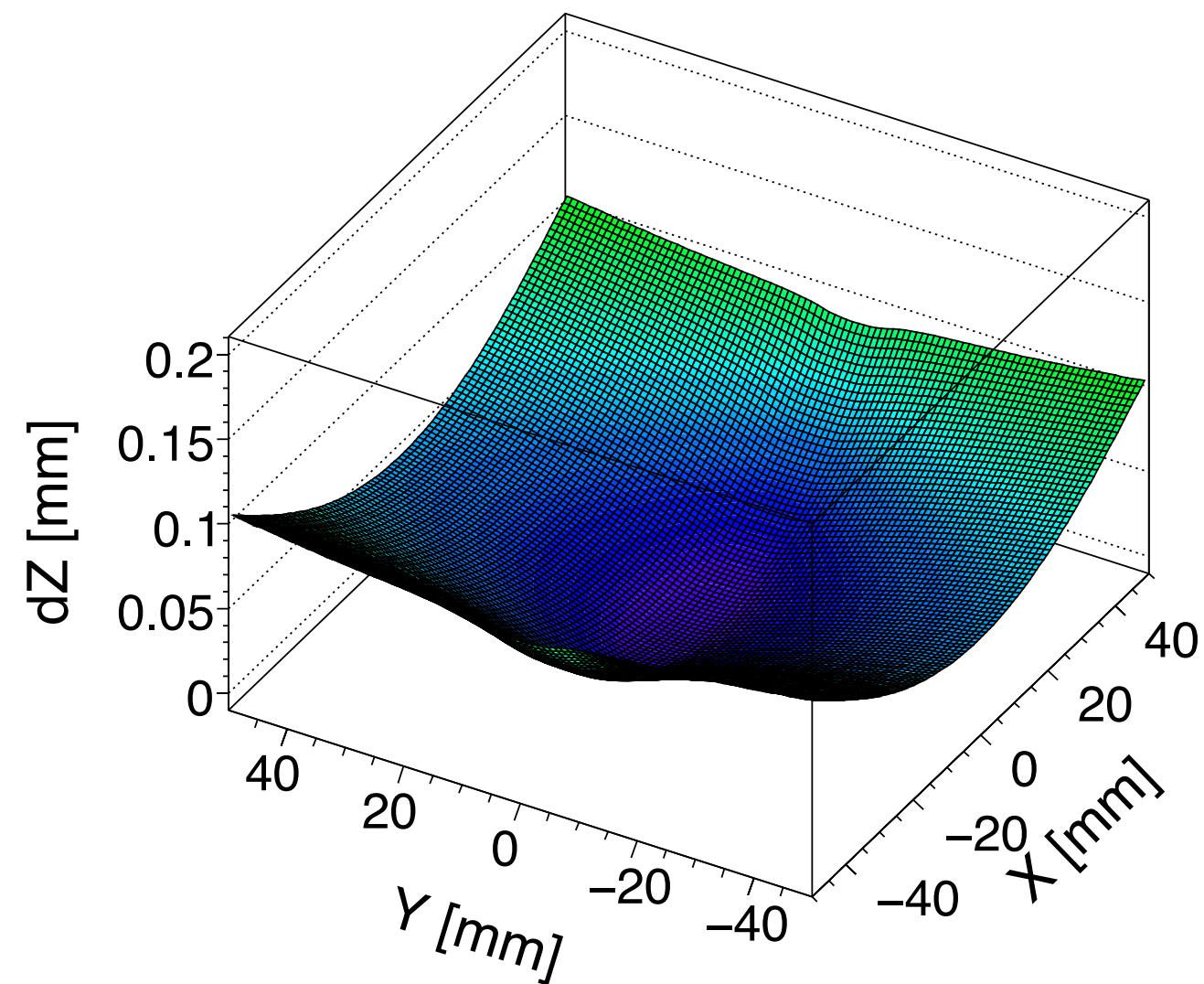
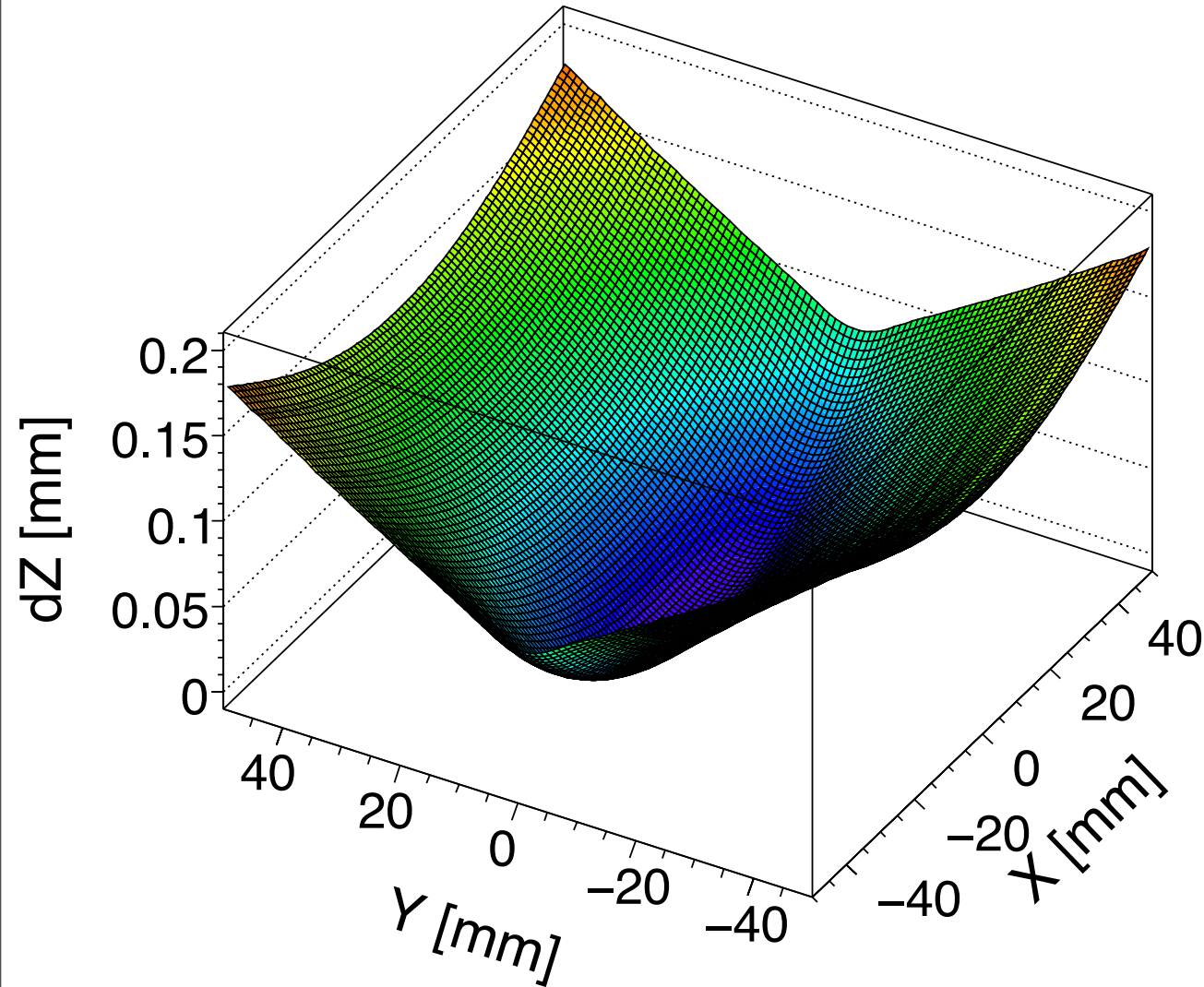
DISPLACEMENT XYZ Magnitude

Min: 0.000 mm Max: 0.181 mm

Part Coordinate System

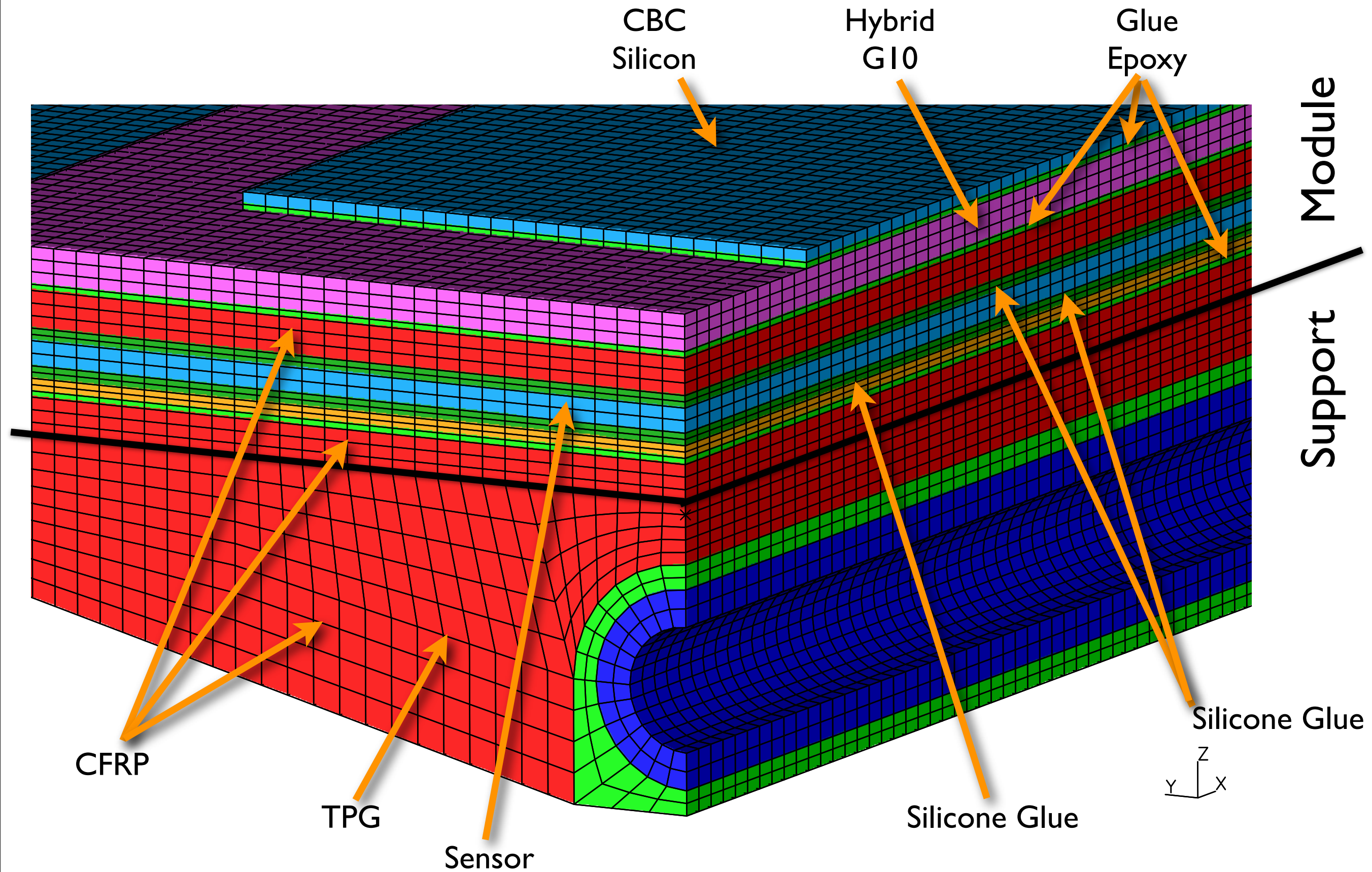


Updates on Long Contact Design with long Strips

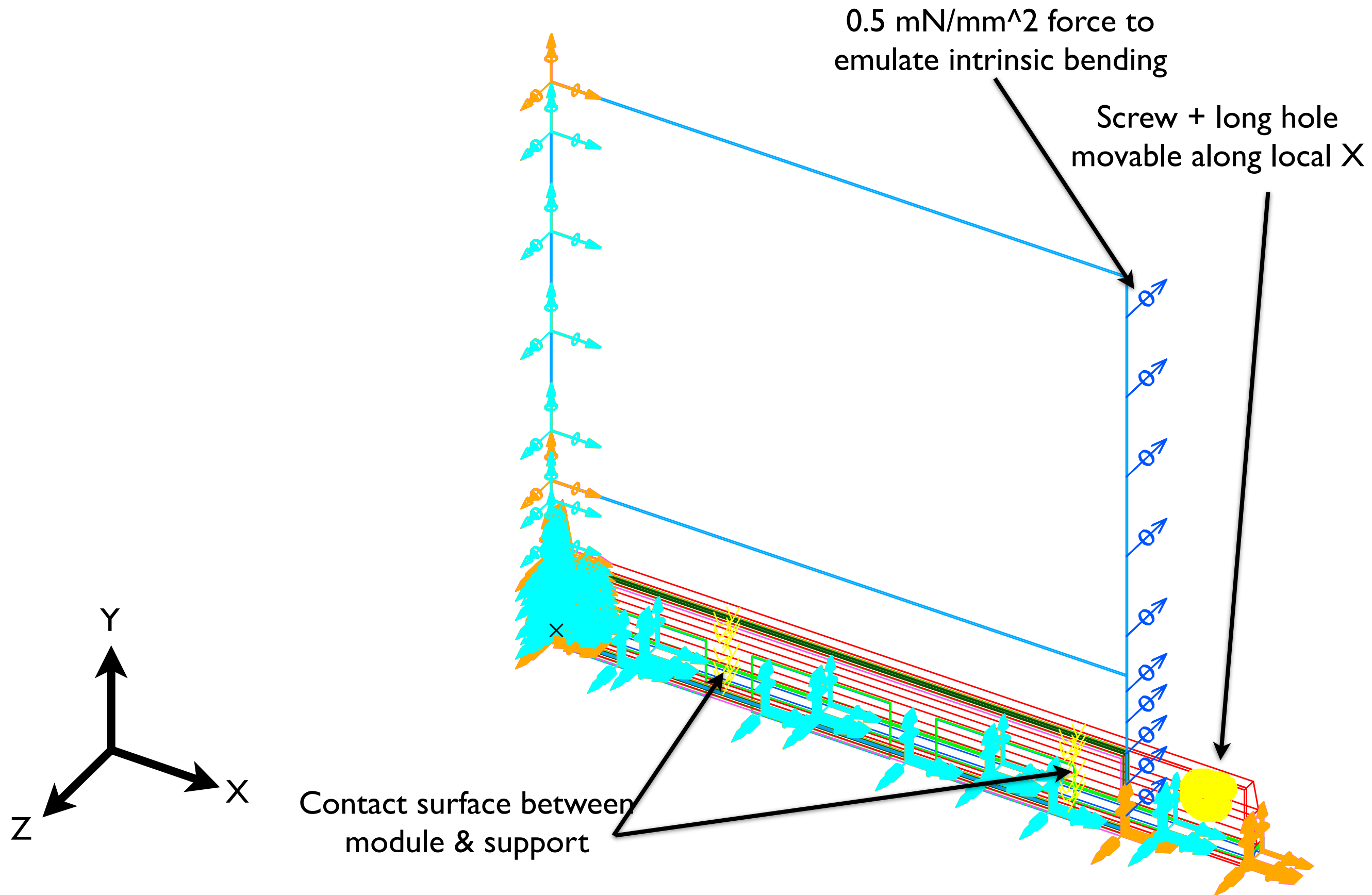


- Bending of Hybrid-CFRP-Sandwich along Y axis smaller due to chips
 - CTE Silicon = 2.0 ppm
 - CTE Kapton = 6.0 ppm
 - CTE CFRP = -1.0 ppm

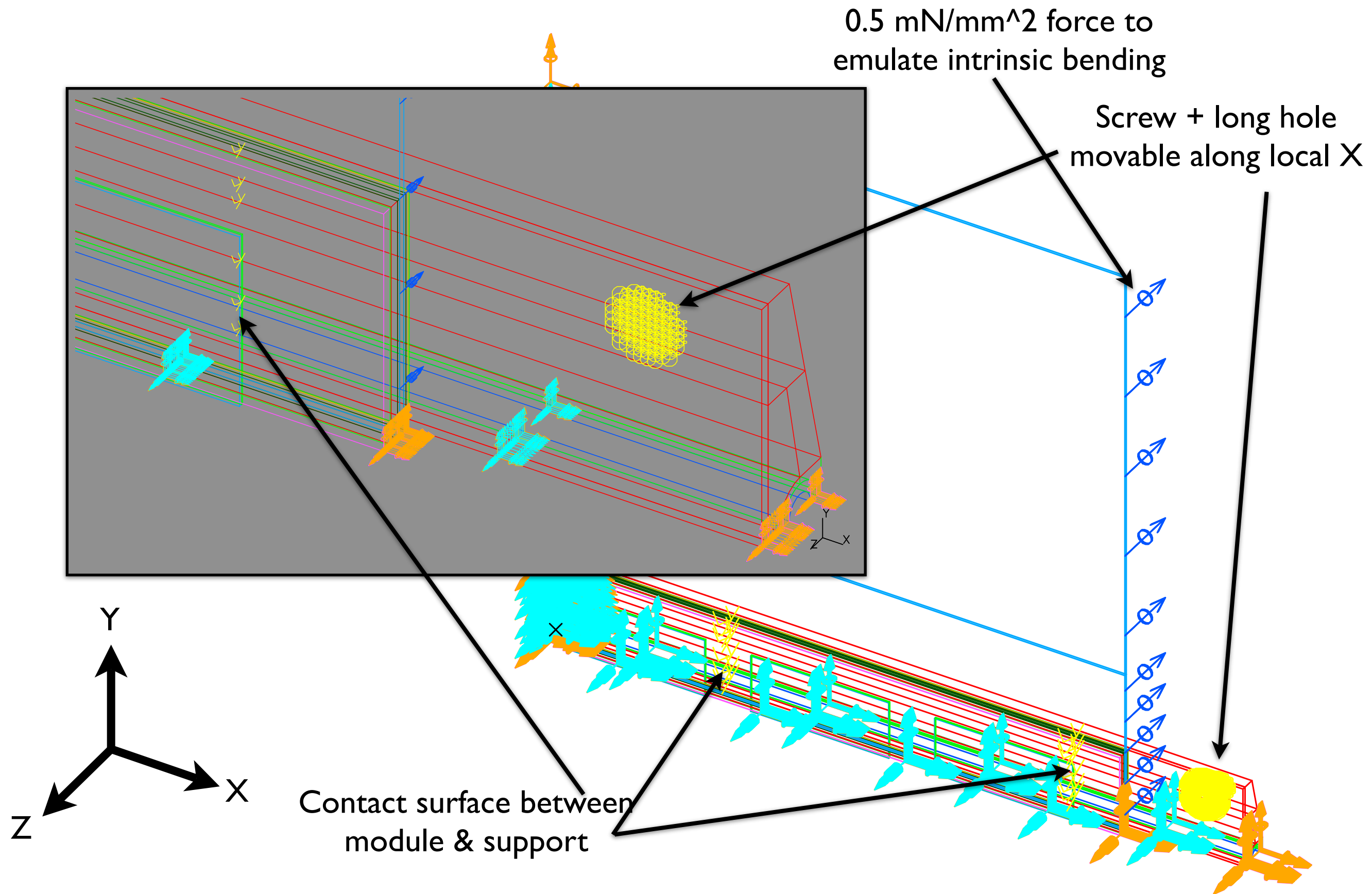
Long Contact Design on Support



Long Contact Design on Support



Long Contact Design on Support



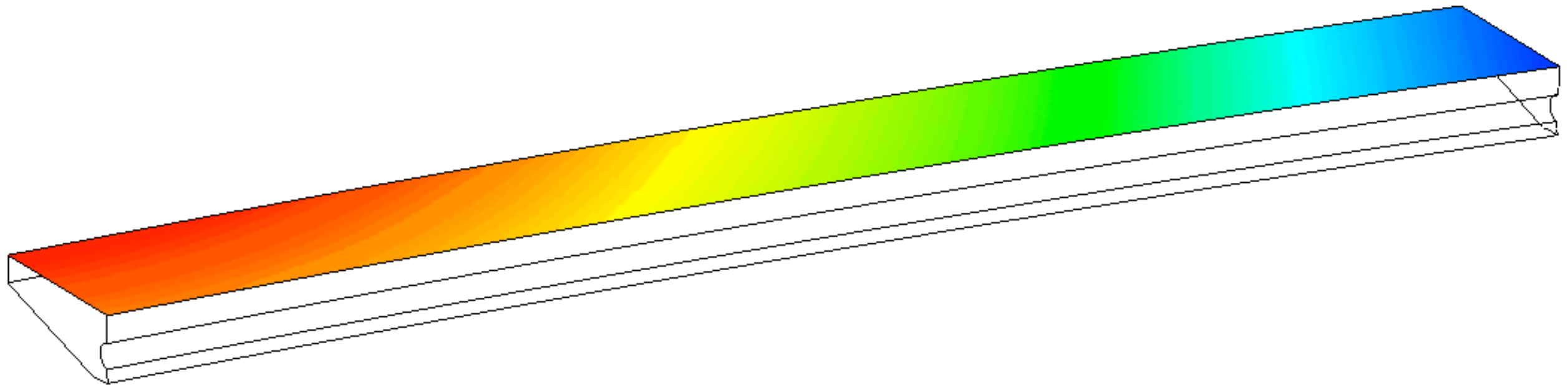
Long Contact Design on Support - Support Deformation

Analysis time was 01-Oct-10 10:59:36

Solset 1 - SOLUTION SET1

DISPLACEMENT Z Unaveraged Top shell

Min: -0.007 mm Max: 0.001 mm



mm

-0.007

-0.005

-0.004

-0.002

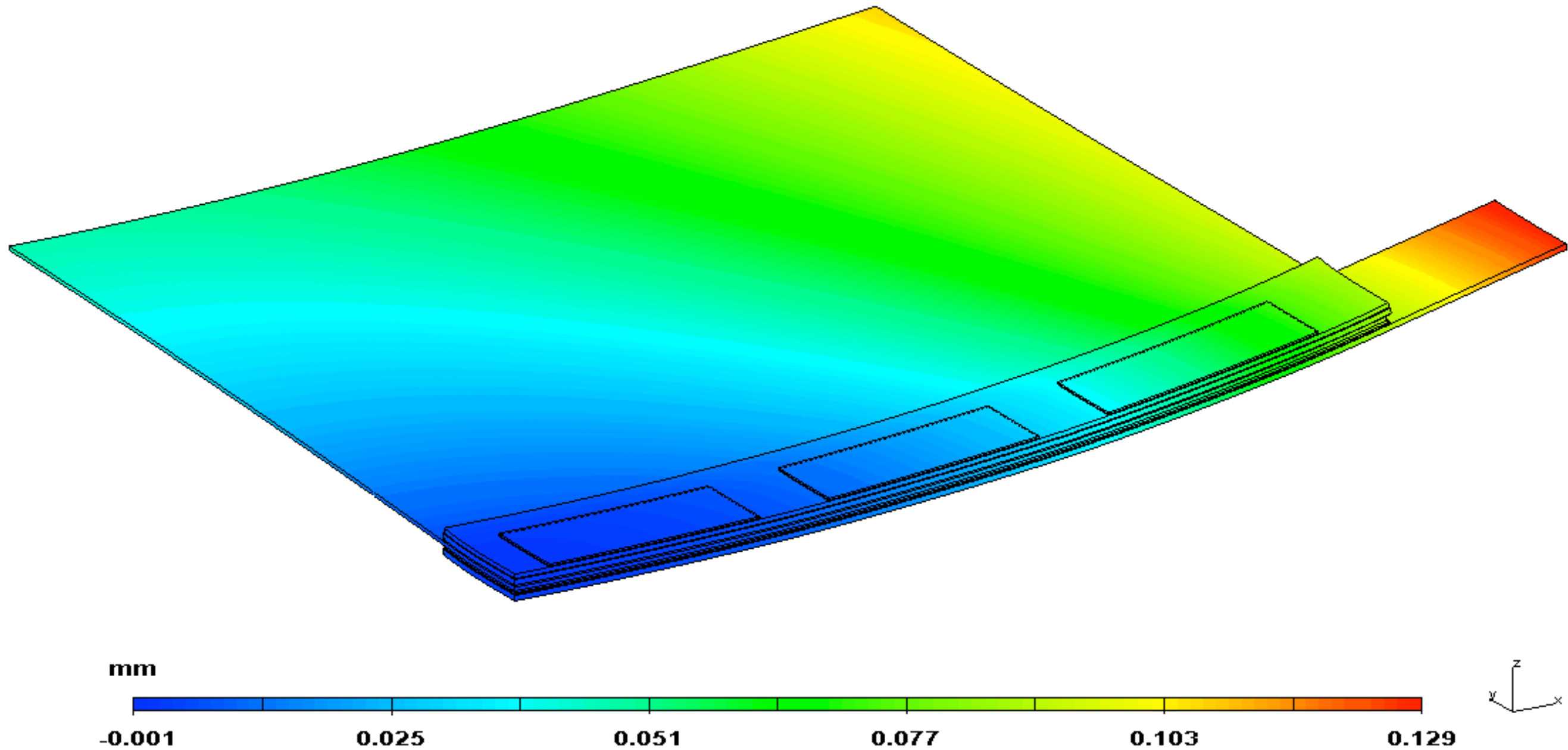
-0.001

0.001



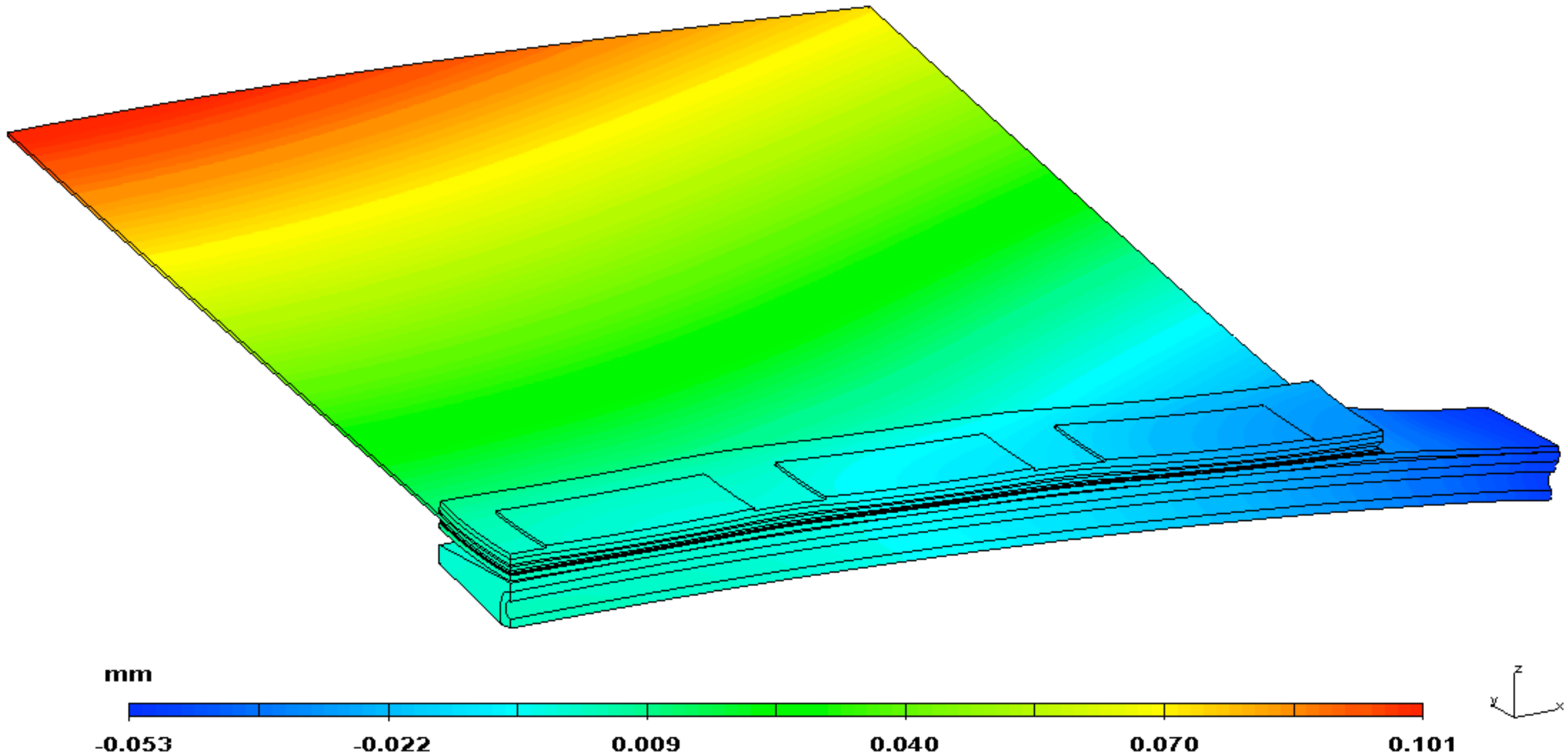
Long Contact Design on Support - Module Deformation

Analysis time was 02-Oct-10 07:23:13
Solset 1 - SOLUTION SET1
DISPLACEMENT Z Unaveraged Top shell
Min: -0.001 mm Max: 0.129 mm



Long Contact Design on Support - Assembly Deformation

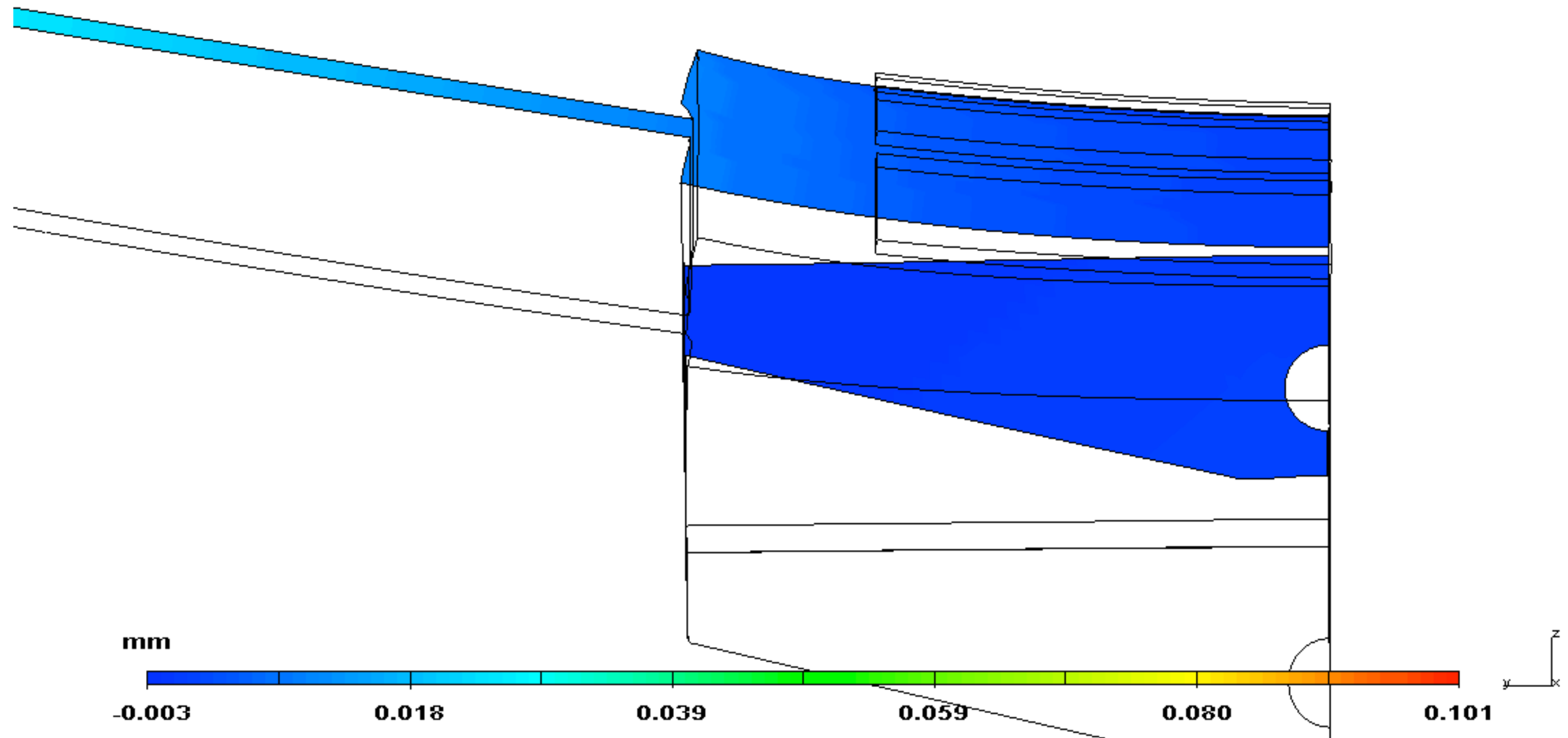
Analysis time was 03-Oct-10 04:33:04
Solset 3 - SOLUTION SET3
DISPLACEMENT Z Unaveraged Top shell
Min: -0.053 mm Max: 0.101 mm



Long Contact Design on Support - Assembly Deformation

YZ Symmetry Plane

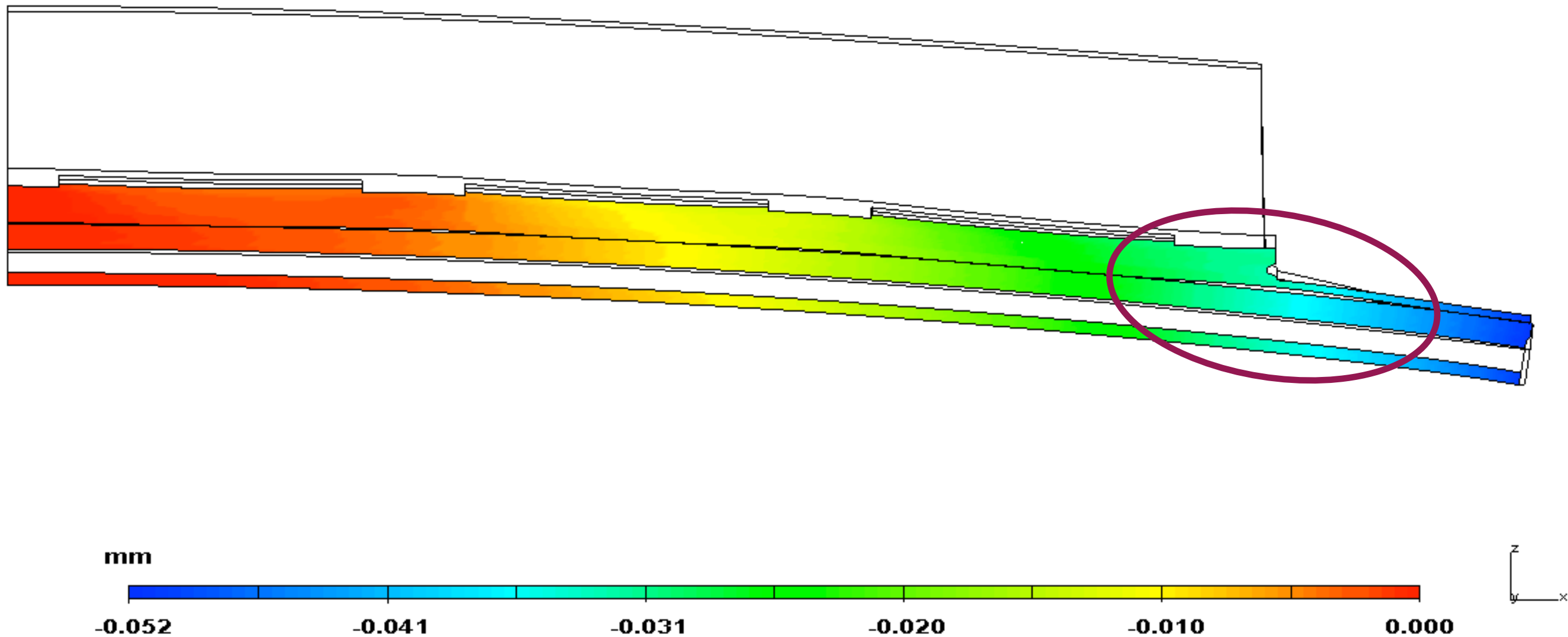
Analysis time was 03-Oct-10 19:52:19
Solset 2 - SOLUTION SET2
DISPLACEMENT Z Unaveraged Top shell
Min: -0.003 mm Max: 0.101 mm



Long Contact Design on Support - Assembly Deformation

XZ Symmetry Plane

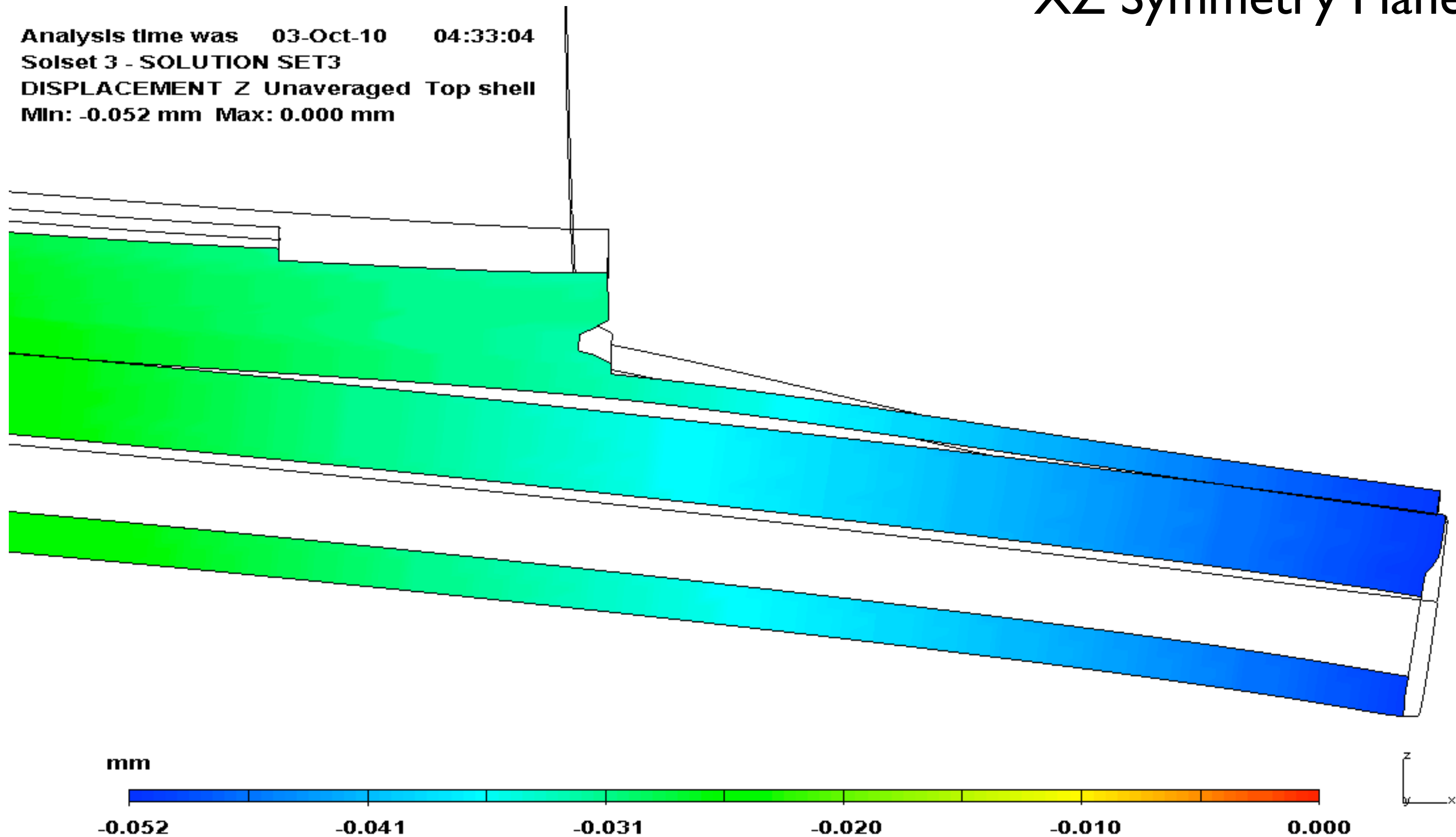
Analysis time was 03-Oct-10 04:33:04
Solset 3 - SOLUTION SET3
DISPLACEMENT Z Unaveraged Top shell
Min: -0.052 mm Max: 0.000 mm



Long Contact Design on Support - Assembly Deformation

XZ Symmetry Plane

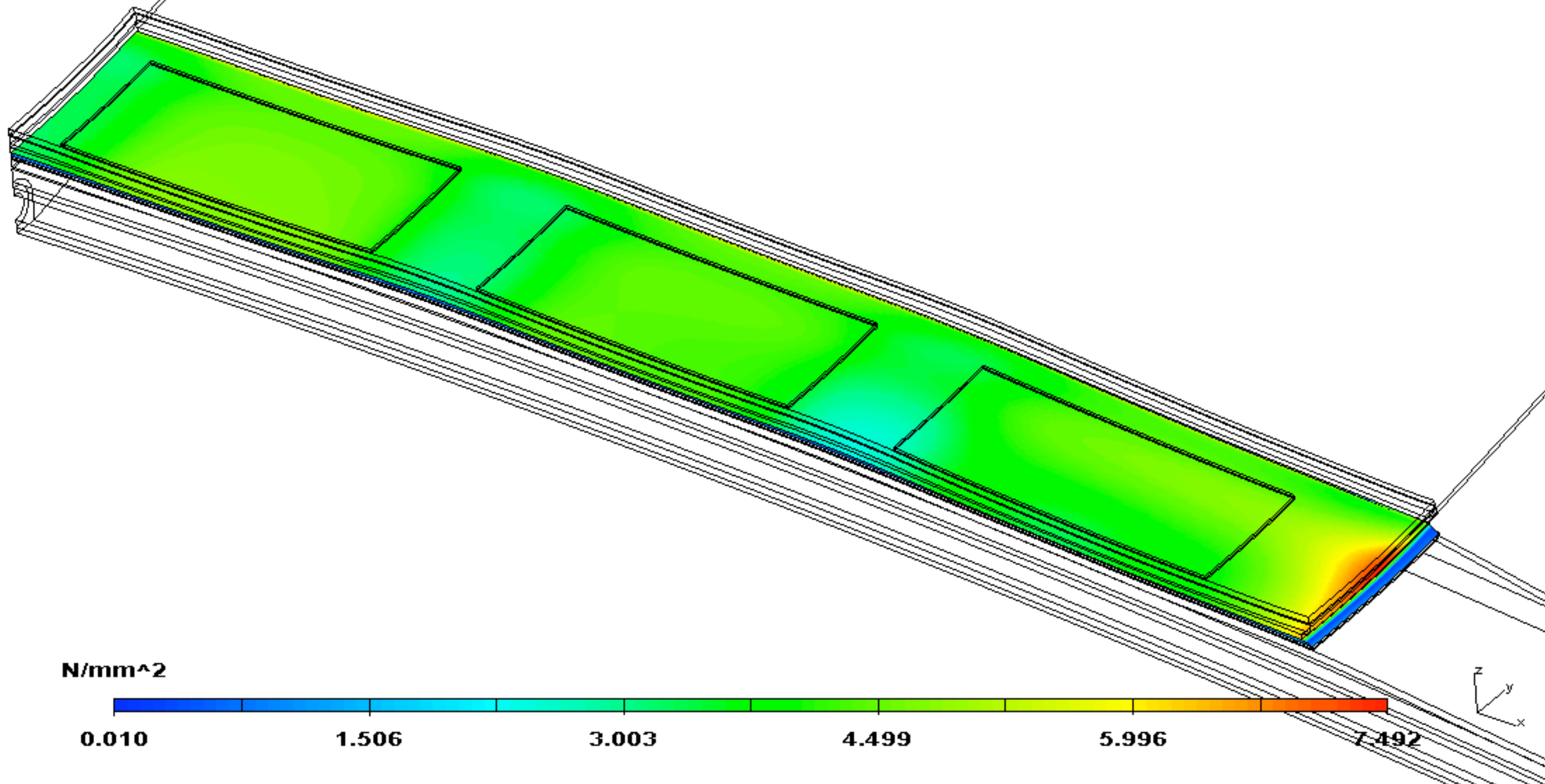
Analysis time was 03-Oct-10 04:33:04
Solset 3 - SOLUTION SET3
DISPLACEMENT Z Unaveraged Top shell
Min: -0.052 mm Max: 0.000 mm



Long Contact Design on Support - Assembly Deformation

Bottom Silicon Glue

Analysis time was 03-Oct-10 19:53:30
Solset 2 - SOLUTION SET2
STRESS Von Mises Averaged Top shell
Min: 0.010 N/mm² Max: 7.492 N/mm²



Long Contact Design on Support - Assembly Deformation

Top Silicon Glue

Analysis time was 03-Oct-10 19:53:30
Solset 2 - SOLUTION SET2
STRESS Von Mises Averaged Top shell
Min: 0.002 N/mm² Max: 11.858 N/mm²

