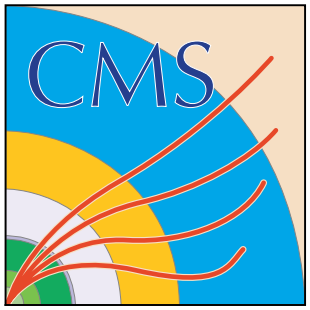
Updates on PT Module FE Analysis

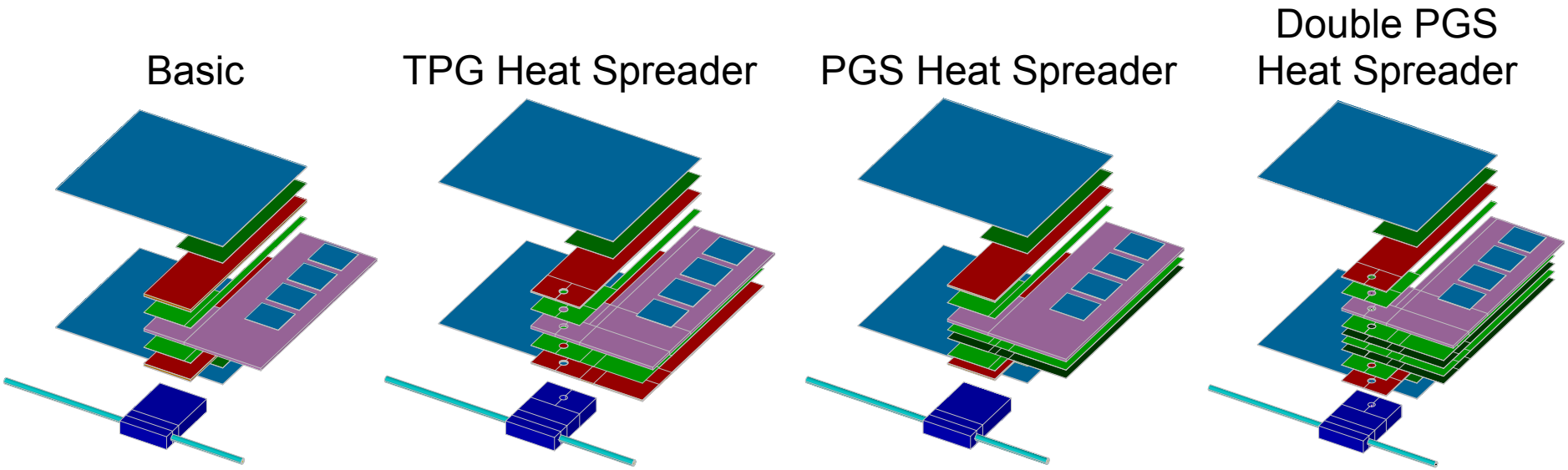


Andreas Mussgiller
Tracker Upgrade Meeting
19/04/2011

HELMHOLTZ ASSOCIATION

DESY

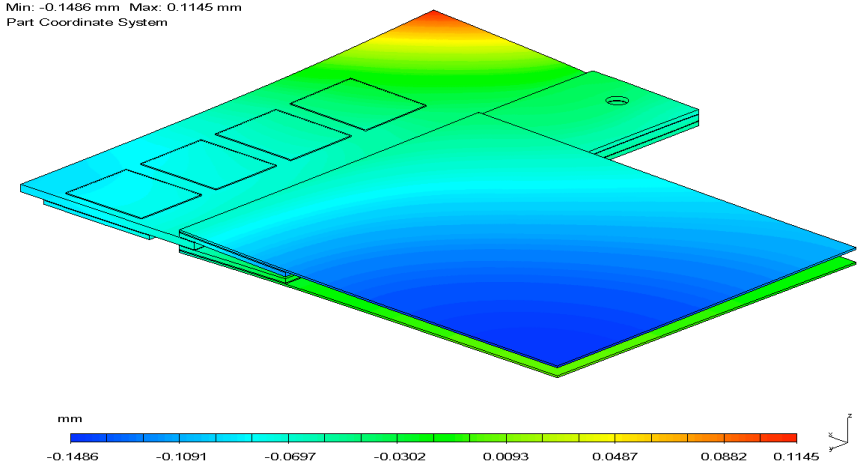
Trigger Module Design Variants



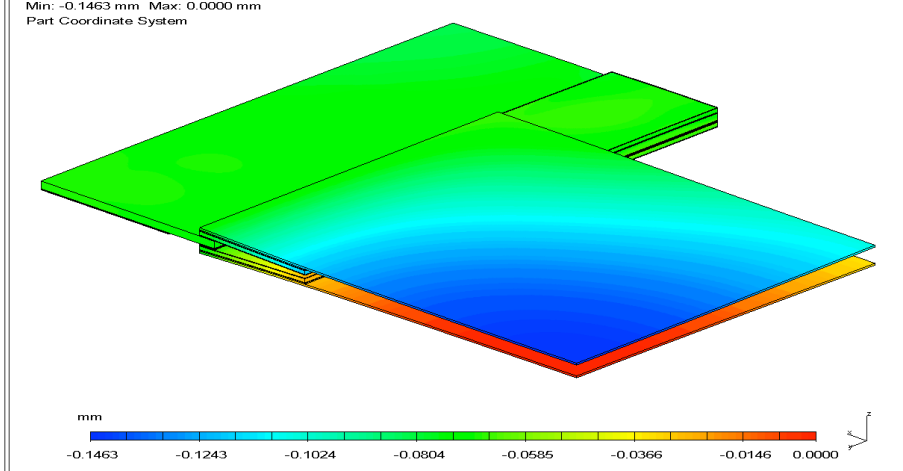
- PGS Heat Spreader design was modelled with two different PGS layer thicknesses (70um/100um)
- Double PGS Heat Spreader design was modelled with two different CFRP support strip fiber orientations
- Why do both sensors bend towards each other in all designs?
- What is the effect of ‚switching' on convection in the thermal calculations?

Z Displacement of Nodes

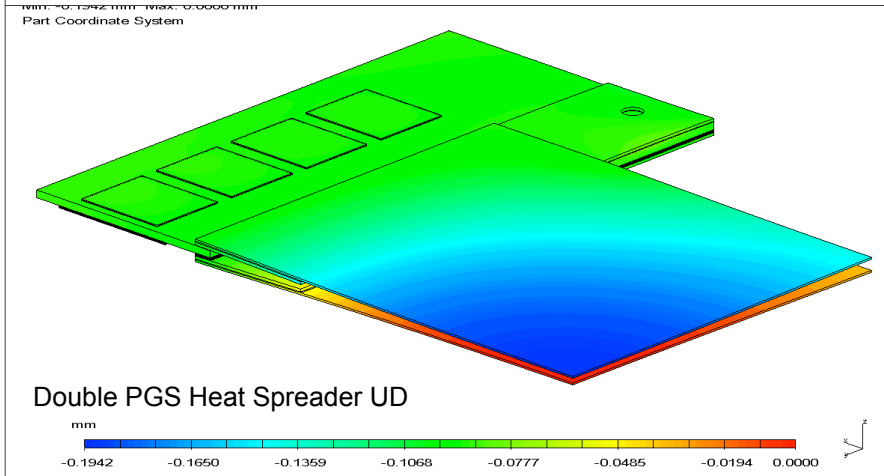
TPG Heat Spreader



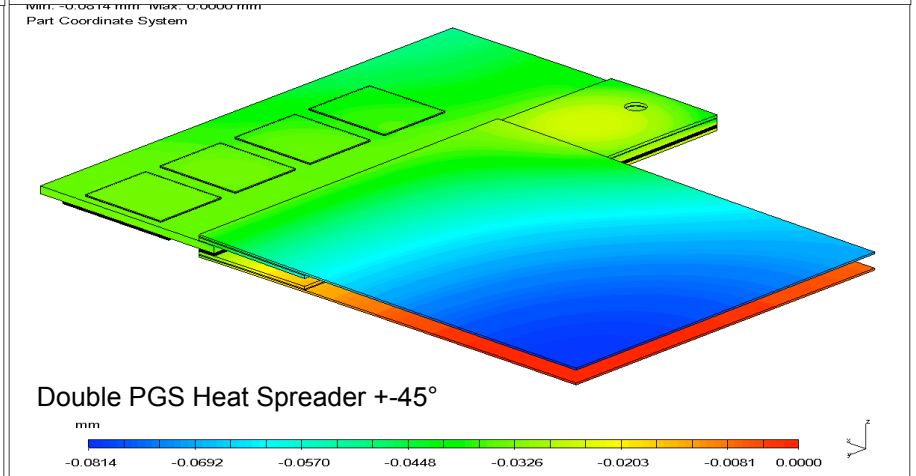
PGS Heat Spreader 70um



Double PGS Heat Spreader UD

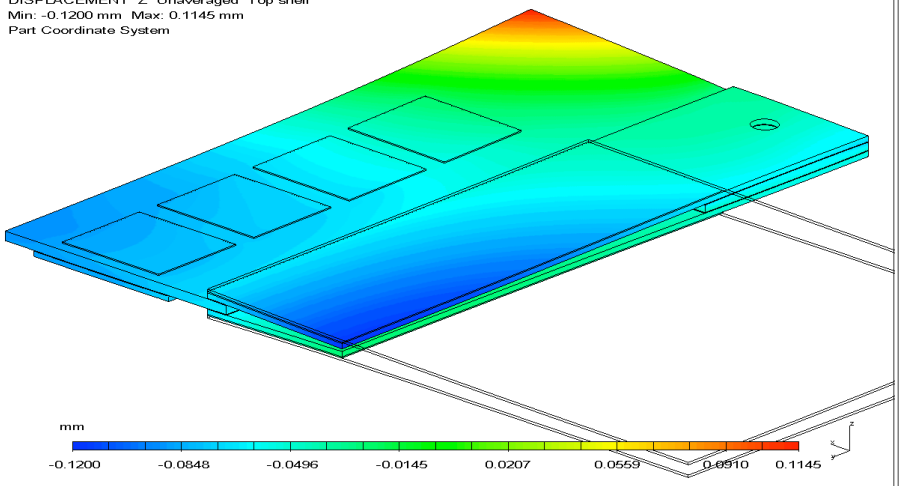


Double PGS Heat Spreader +-45°

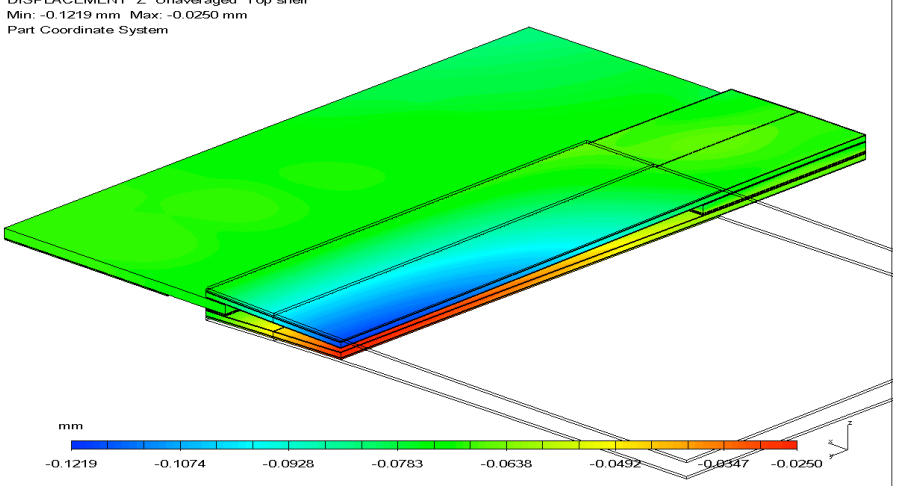


Z Displacement of Nodes - Displayed without Sensors

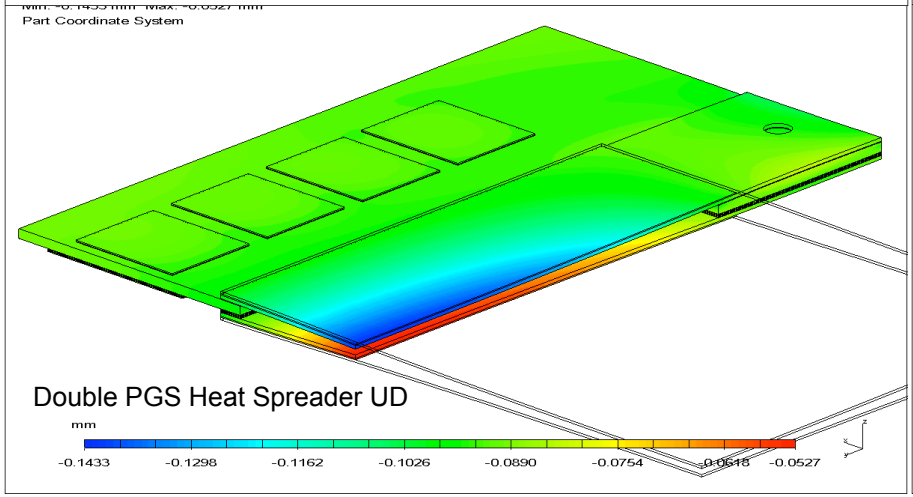
TPG Heat Spreader



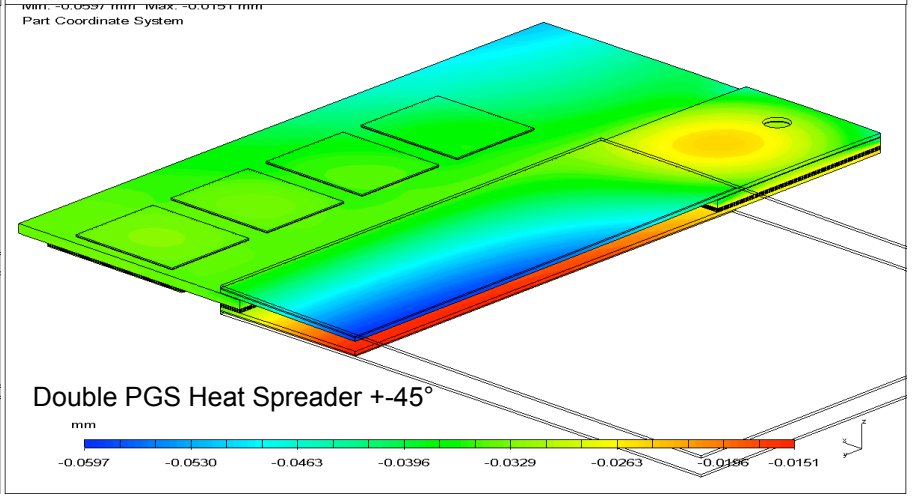
PGS Heat Spreader 70um



Double PGS Heat Spreader UD



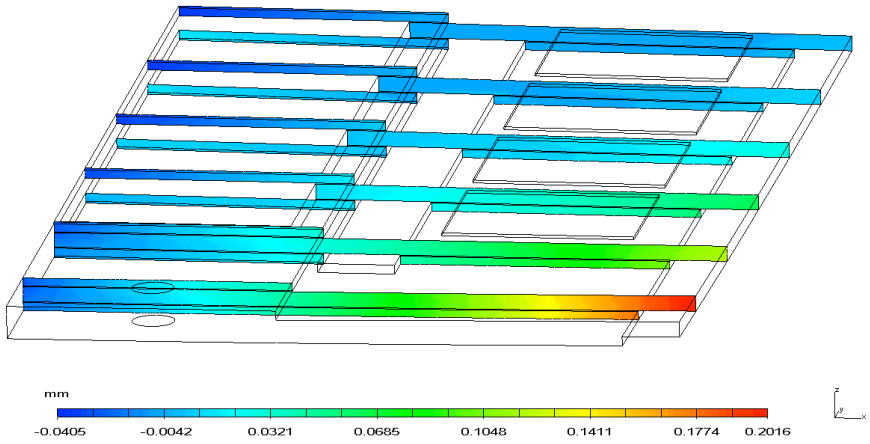
Double PGS Heat Spreader +-45°



Z Displacement of Nodes - Modell without Sensors

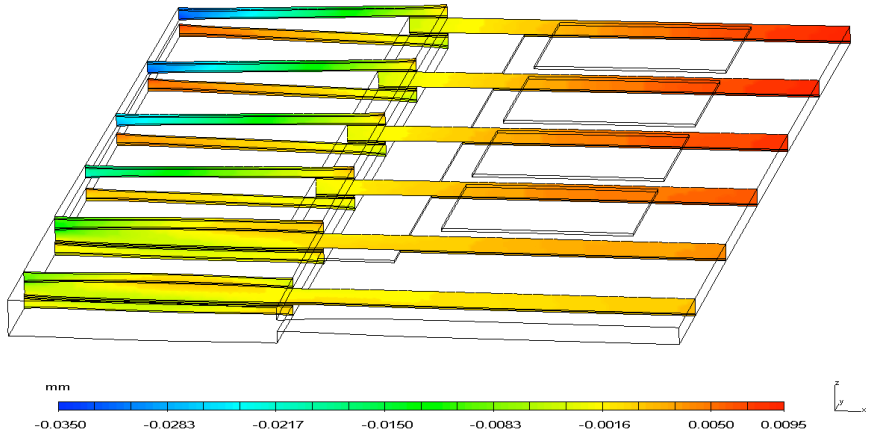
TPG Heat Spreader

FEPart1
FEM3 - Mechanical - NoSensors
Analysis time was 06-Apr-11 11:52:09
Solset 1 - SOLUTION SET1
DISPLACEMENT Z Unaveraged Top shell
Min: -0.0405 mm Max: 0.2016 mm
Part Coordinate System

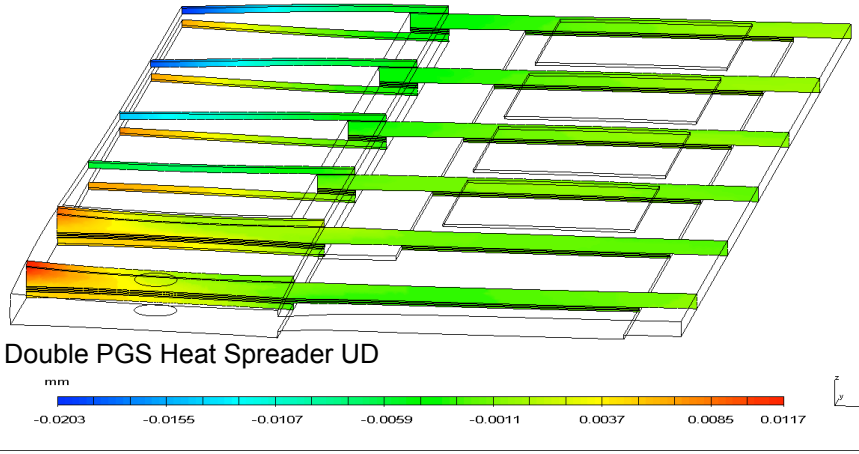


PGS Heat Spreader 70um

FEPart1
FEM3 - Mechanical 0.070 - NoSensors
Analysis time was 06-Apr-11 13:18:24
Solset 1 - SOLUTION SET1
DISPLACEMENT Z Unaveraged Top shell
Min: -0.0350 mm Max: 0.0095 mm
Part Coordinate System

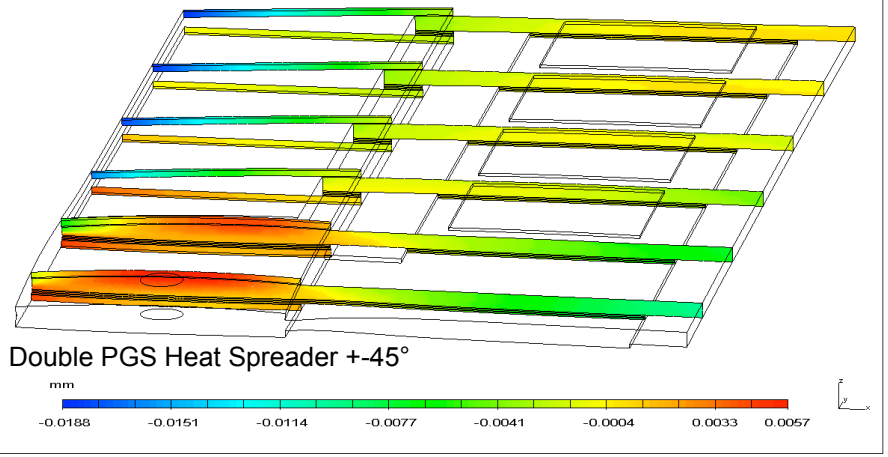


Min: -0.0203 mm Max: 0.0117 mm
Part Coordinate System



Double PGS Heat Spreader UD

Min: -0.0188 mm Max: 0.0057 mm
Part Coordinate System

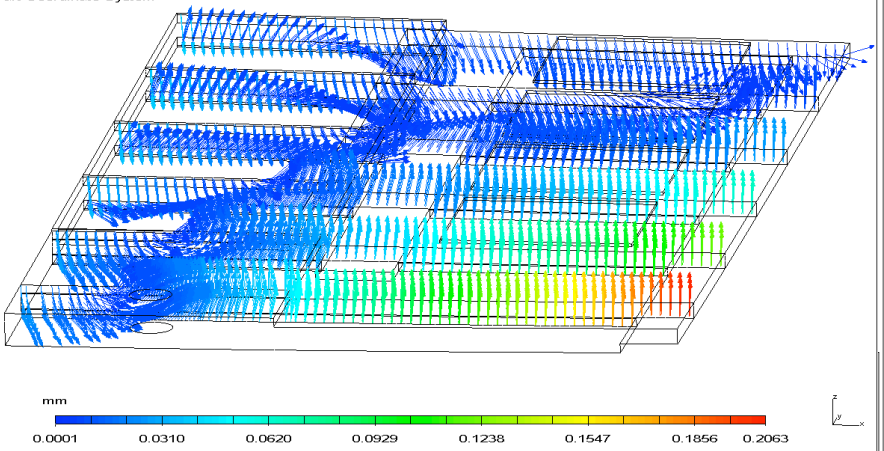


Double PGS Heat Spreader +-45°

XYZ Displacement of Nodes - Modell without Sensors

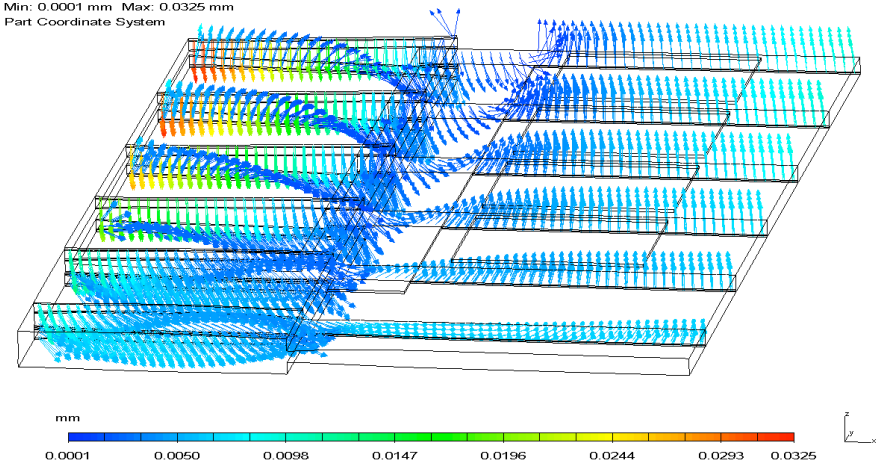
TPG Heat Spreader

FEPart1
FEM3 - Mechanical - NoSensors
Analysis time was 06-Apr-11 11:52:09
Solset 1 - SOLUTION SET1
DISPLACEMENT XYZ Unaveraged Top shell
Min: 0.0001 mm Max: 0.2063 mm
Part Coordinate System

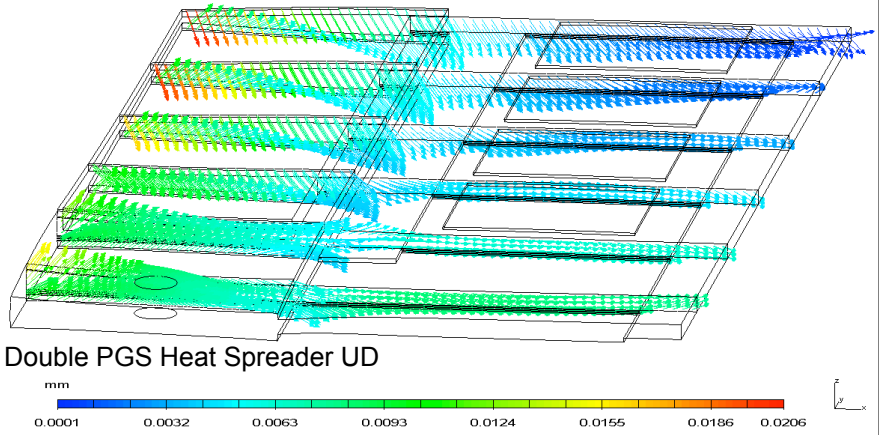


PGS Heat Spreader 70um

FEPart1
FEM3 - Mechanical 0.070 - NoSensors
Analysis time was 06-Apr-11 13:18:24
Solset 1 - SOLUTION SET1
DISPLACEMENT XYZ Unaveraged Top shell
Min: 0.0001 mm Max: 0.0325 mm
Part Coordinate System

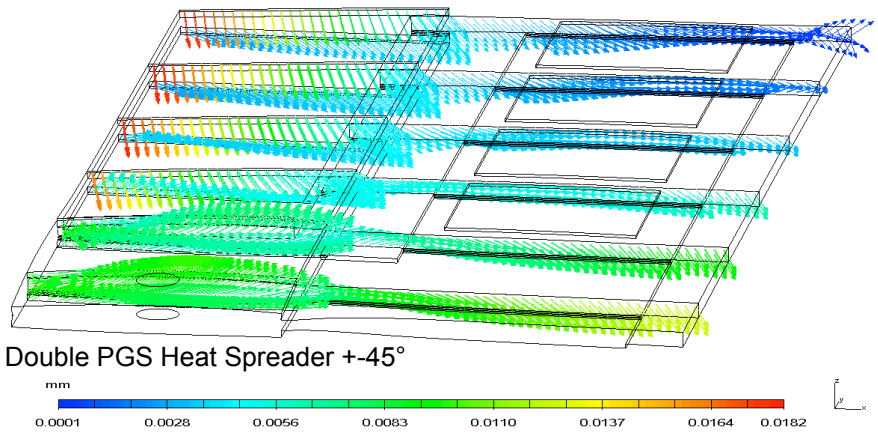


Min: 0.0001 mm Max: 0.0206 mm
Part Coordinate System



Double PGS Heat Spreader UD

Min: 0.0001 mm Max: 0.0182 mm
Part Coordinate System



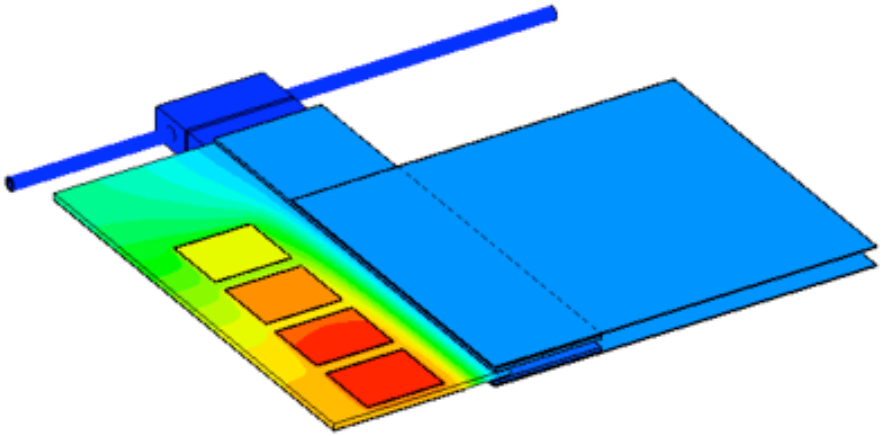
Double PGS Heat Spreader +-45°

Thermal FE Analysis with Convection

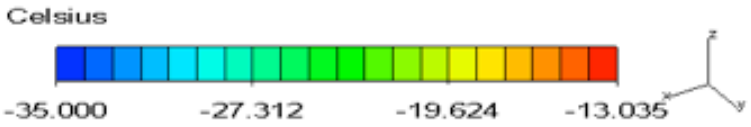
- 100mW consumed by sensor (25mW in FE model)
- 2W consumed by chips (125mW per chip; 500mW in FE model)
- Heat transfer coefficient for free convection assumed to be 5W/m^2/K
- Ambient temperature set such that heat flux to ambient is zero
  - No additional heat load or loss due to convection

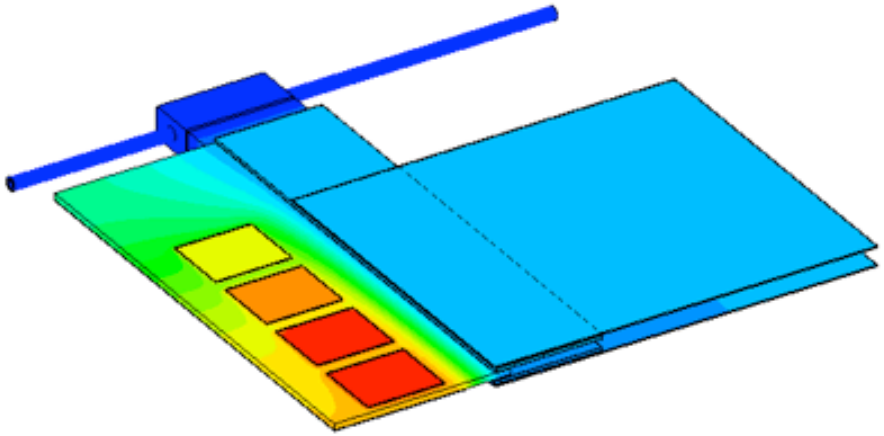
PGS Heat Spreader Design (70um)

- Ambient temperature set to -30.1°C
- 10mW Remaining convective heat loss



without convection

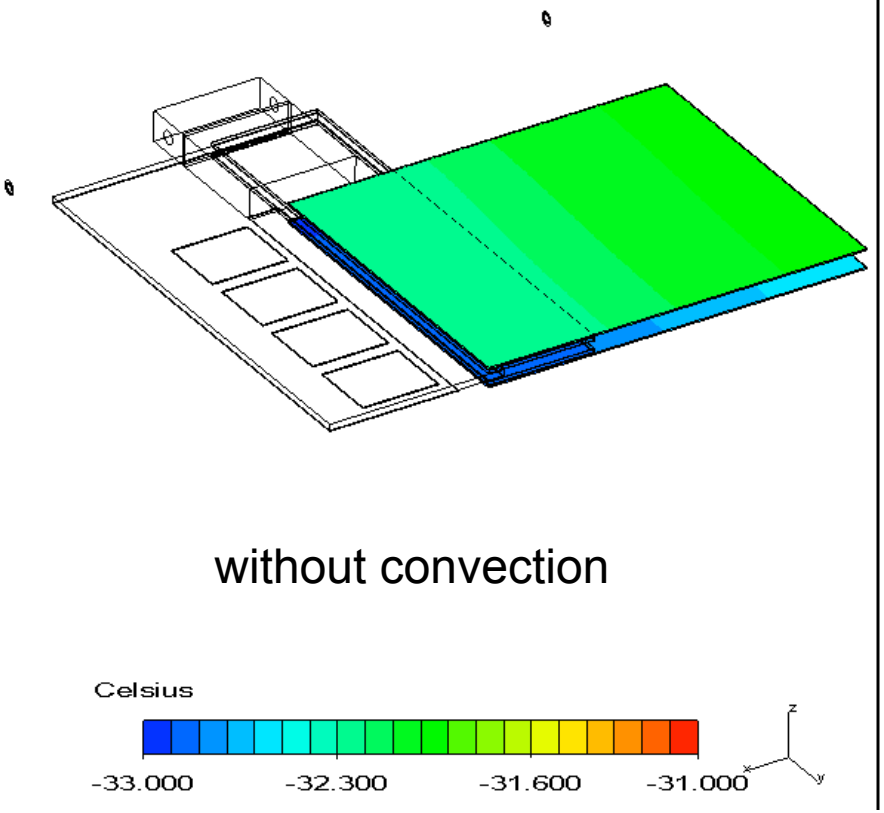




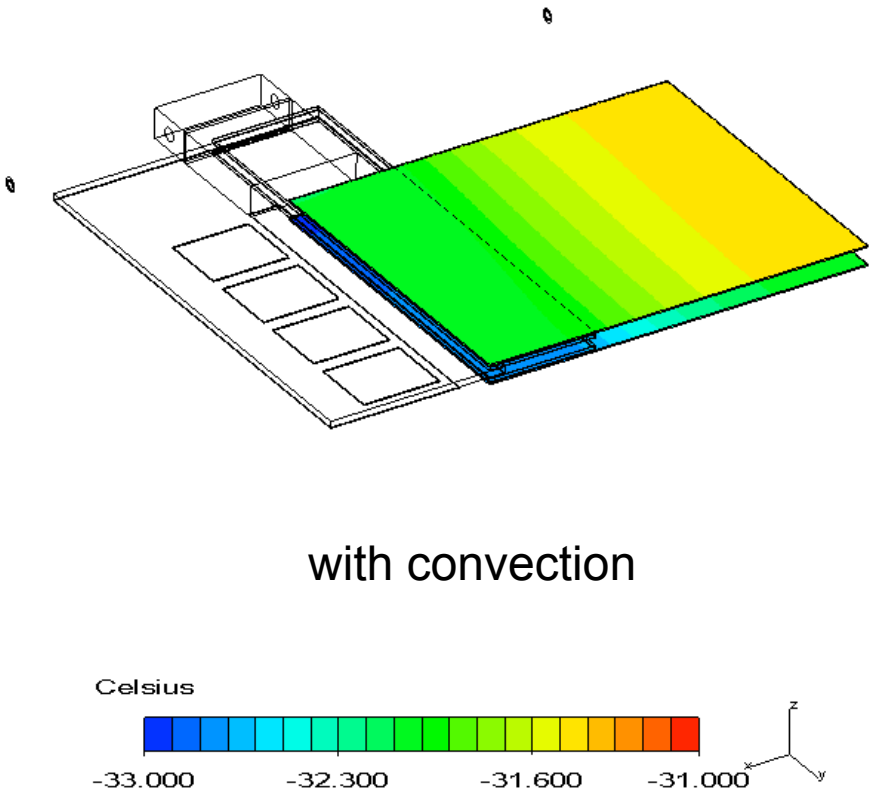
with convection

PGS Heat Spreader Design (70um)

- Ambient temperature set to -30.1°C
- 10mW Remaining convective heat loss



without convection



with convection