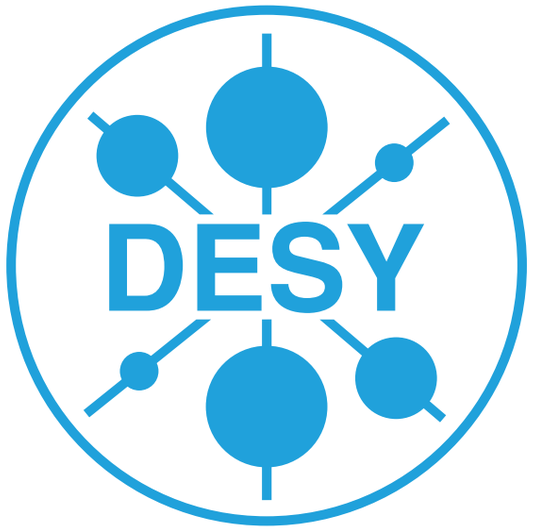
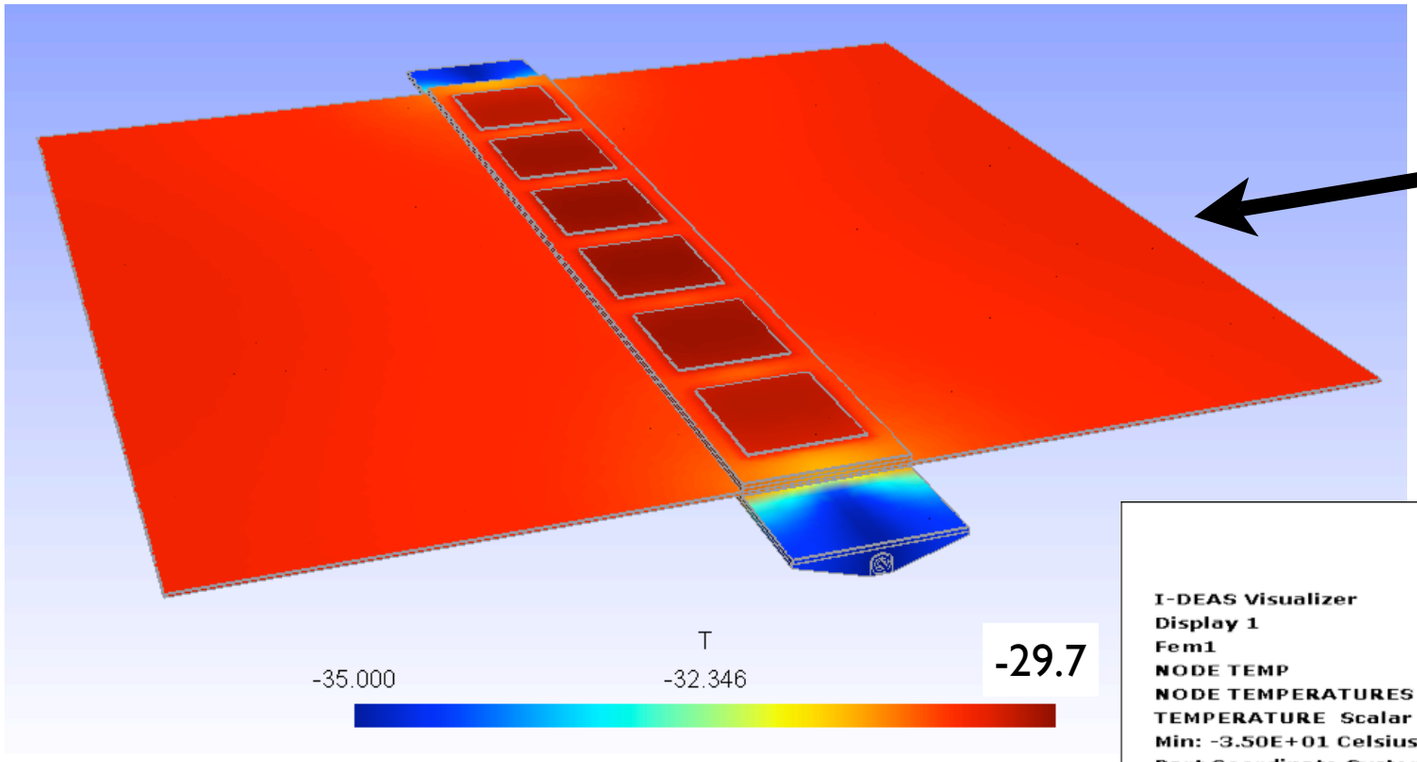
CMS Tracker Upgrade HH Activities

Günter Eckerlin, Jens Hansen,
Carsten Muhl, Andreas Mussgiller, Jan Olzem



DESY CMS Group Meeting
05/07/10

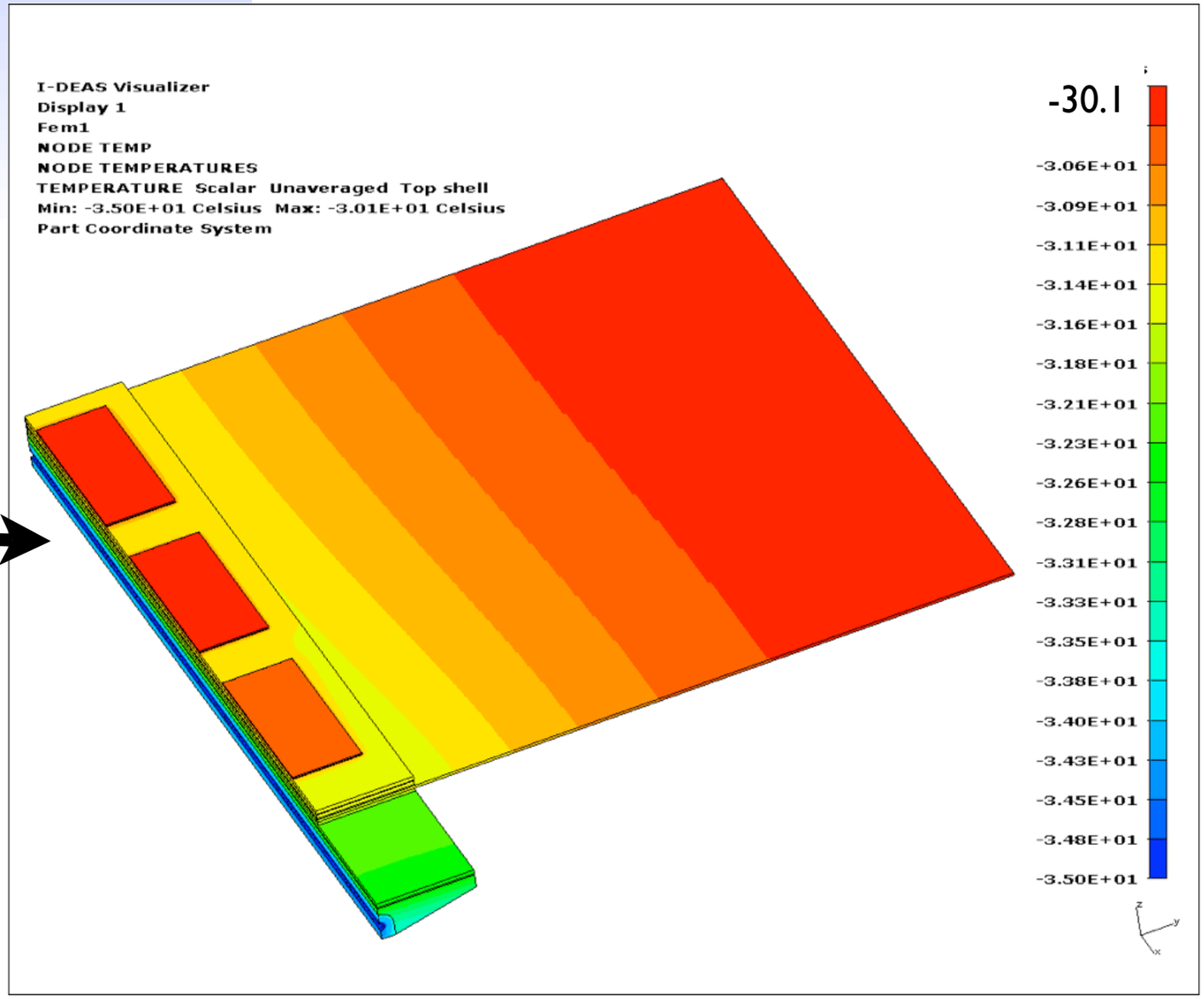
Finite Element Calculations (Thermal)



GetDP
- Sensor power: 100mW
- CBC power: 6 * 125mW = 750mW
- CO2 temp: -35°C

I-DEAS
- Sensor power: 25mW
- CBC power: 187.5mW
- CO2 temp: -35°C
- Only quarter of module calculated

- Difference in maximum temperature due to difference in material properties of CFRP

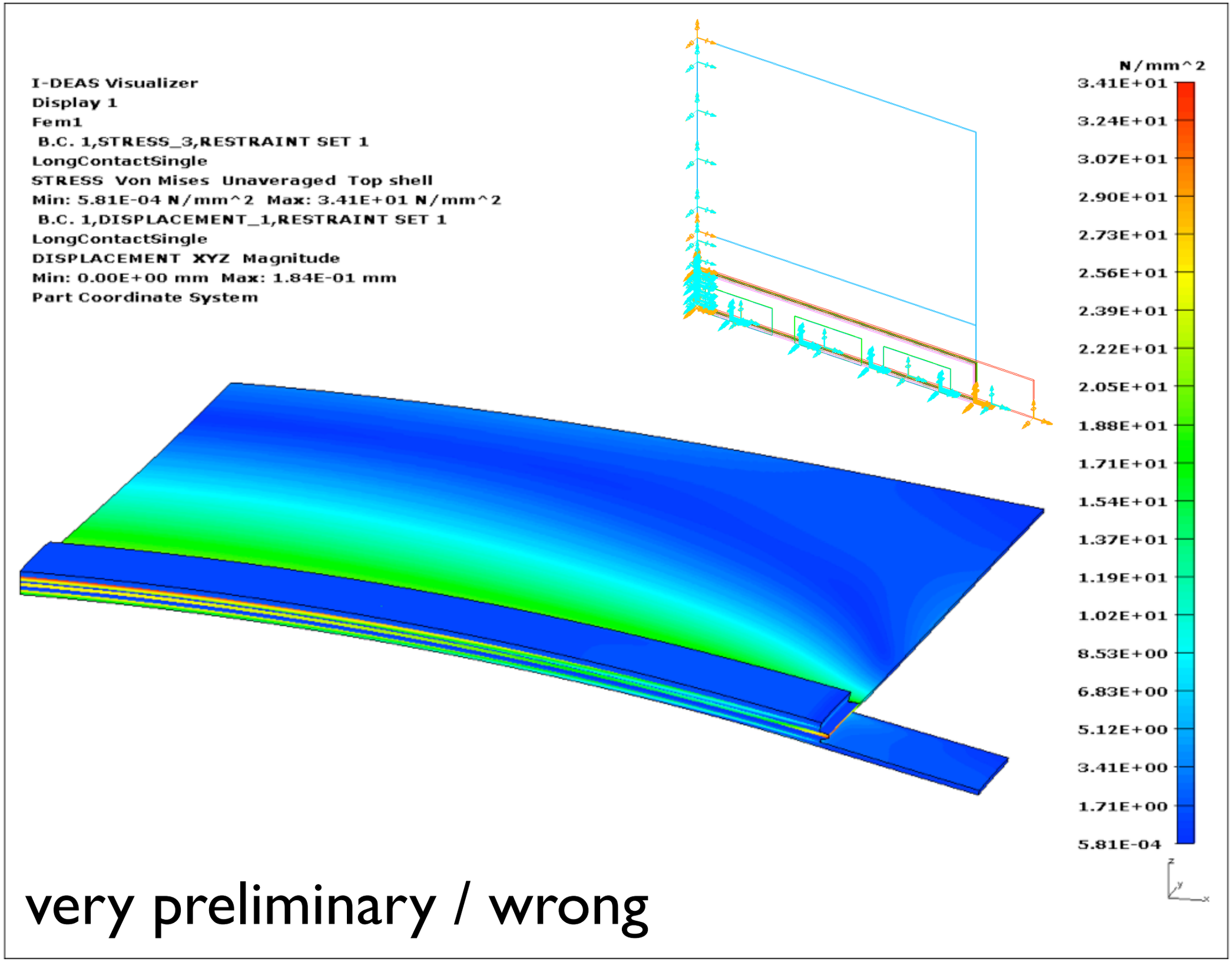


Finite Element Calculations (Deformation)

- Modules are multi-layer stacks of components each with different thermal expansion coefficients
- Need to define realistic values for mechanical material properties (especially for orthotropic materials, foils and glues)
  - Modulus of elasticity, Poisson ratio, shear modulus, CTE ...

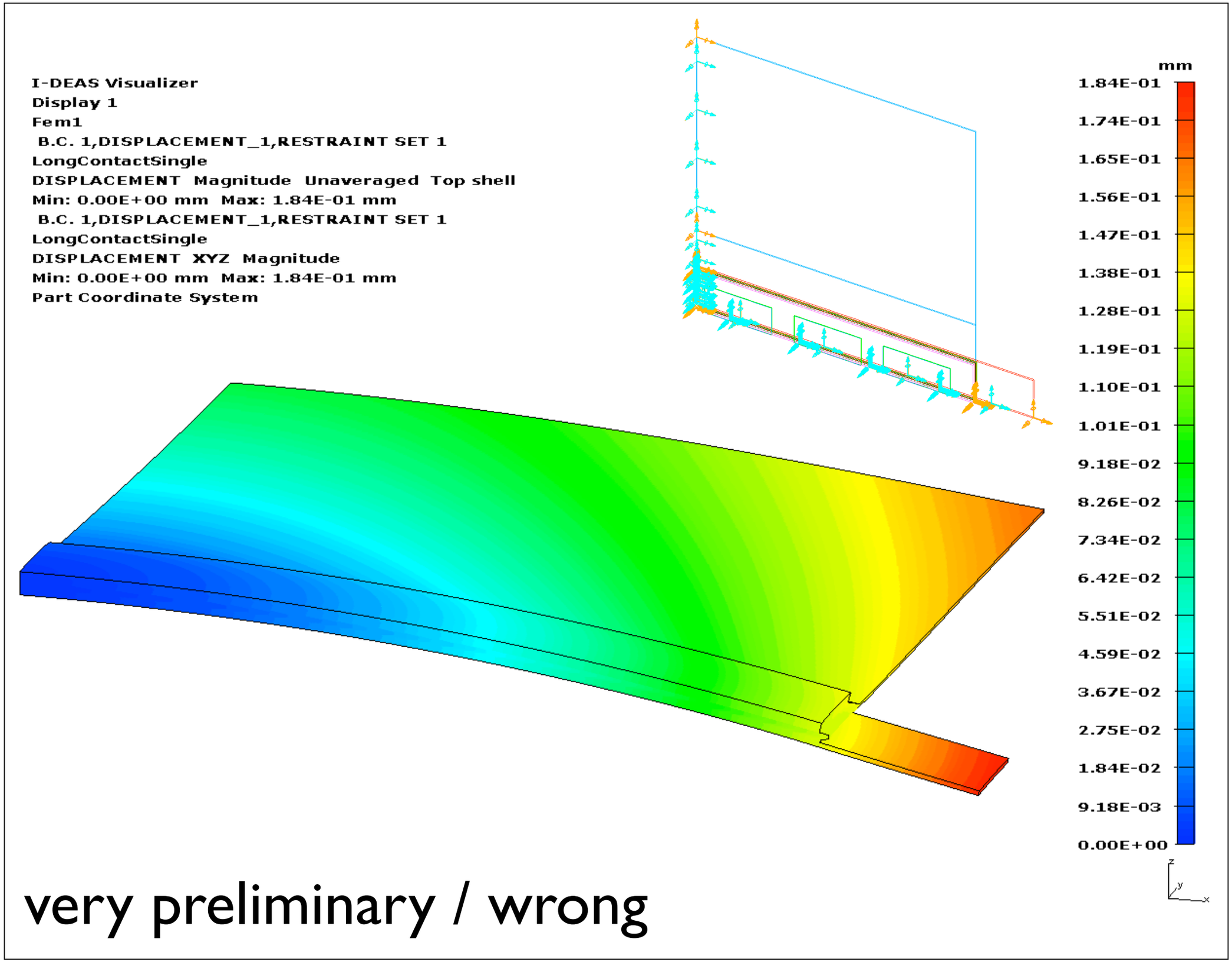
- In case of CFRP decided to use the I-IDEAS internal laminate feature
  - Define a fiber material (K13D2U by Mitsubishi Chemical)
  - Define epoxy material
  - Define a mixed material with e.g. 40% / 60% volume fraction
  - Build a laminate out several layers of the mixed material with different fiber orientations
  - Use material properties of laminate for final calculations
  - works well, but...
- I-DEAS laminate tool can‘t handle negative CTEs which messes up final properties of laminate
- Results shown on next slide were calculated with wrong CTE for CFRP

Finite Element Calculations (Stress)



very preliminary / wrong

Finite Element Calculations (Displacement)



very preliminary / wrong

Lab Measurements

- Preparing for calibration measurements
  - First measurements show significant difference in sensor readings even if sensors are close to each other
  - Not clear if difference is related to thermal coupling, heat load over the cable or the sensors (plus cabling) itself
  - Ordered calibrated precision thermometer that will become an additional channel of the setup
  - Most likely ready by the time the summer students arrive
  - Will be first lab measurements of our summer students