Updates on Mechanics of the FWE EMC

PANDA Collaboration Meeting 18/3, GSI, November 6, 2018

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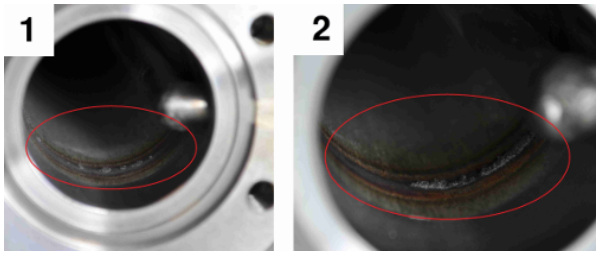
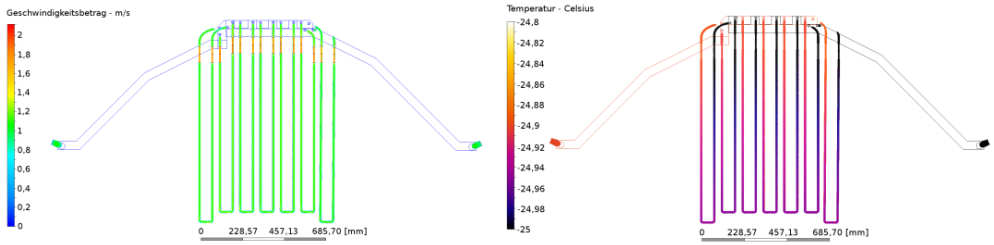
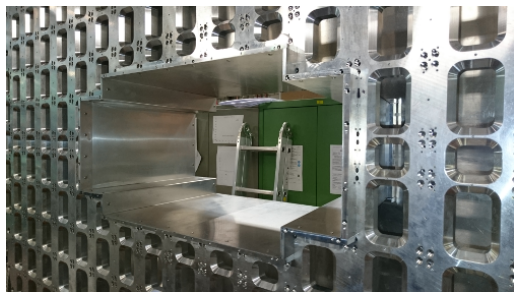
Outline



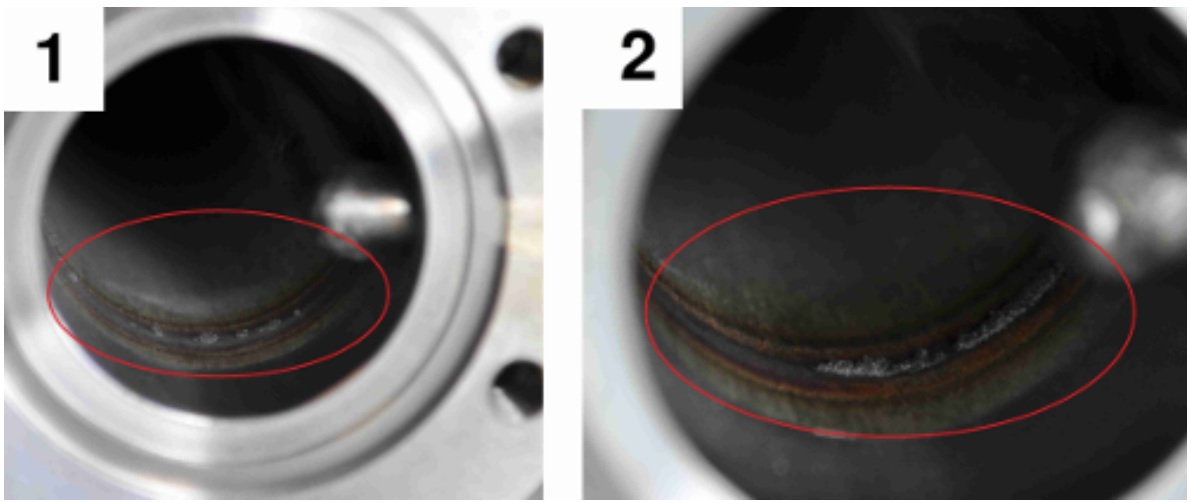


- Passivation of Coolant Pipings
- Coolant Flow Simulation
- Inner Stiffener Ring
- Preparation of Submodule Mounting in Jülich



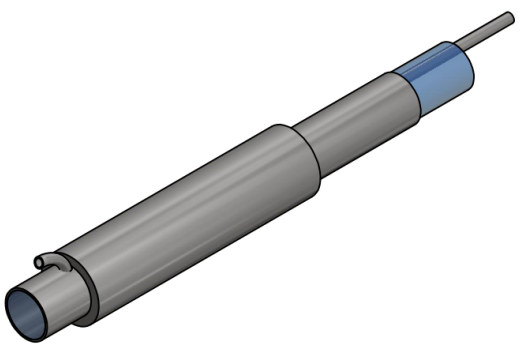
Passivation of Coolant Pipings

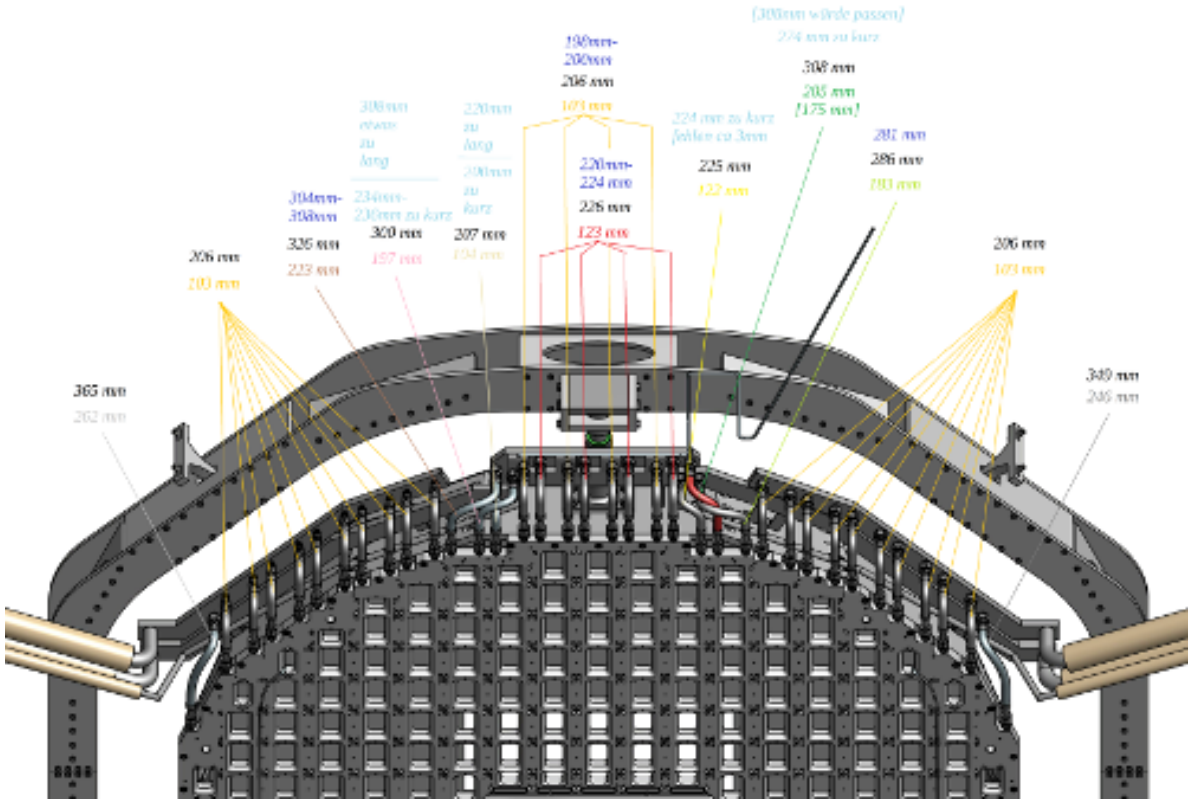
- (Forward endcap) calorimeter coolant fluid: Water-methanol mixture (40:60)
- Coolant piping material: Stainless steel
- Corresponding welding line regions susceptible to corrosion in water/methanol
- Experimental verification by Claudius Schnier



Passivation of Coolant Pipings

- Remedy: Chemical or thermal passivation
- Thermal passivation at 1050 °C may cause deformation
- Chemical passivation:
  Bath of hydrofluoric and nitric acid mixture



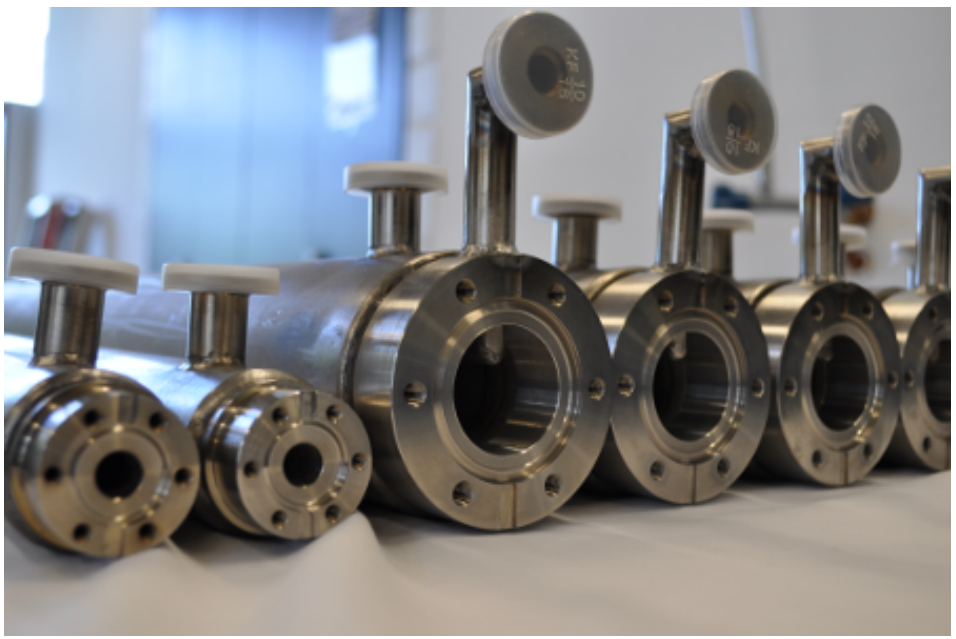


Passivation of Coolant Pipings

- Swagelok threads silver coated, need to be protected!
- Corresponding screws to close the nuts
  (Swagelok proprietary VCR thread)
- Leak check inspection holes in nuts need to be closed
  (M3 threads cut, closed by screws)

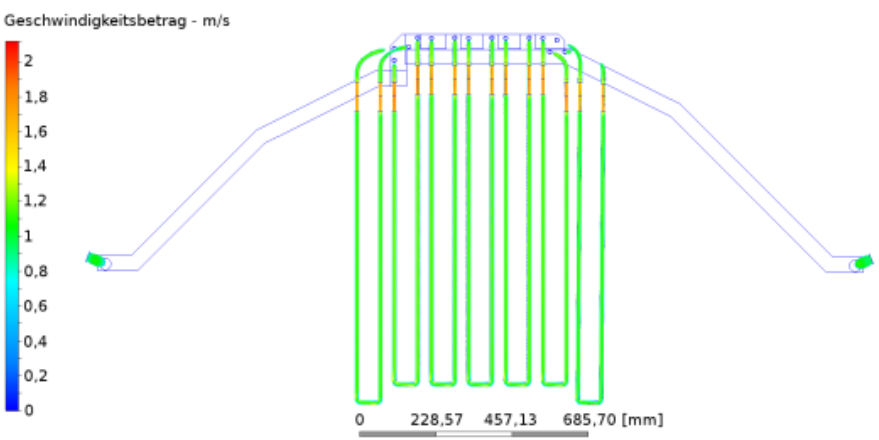
Passivation of Coolant Pipings

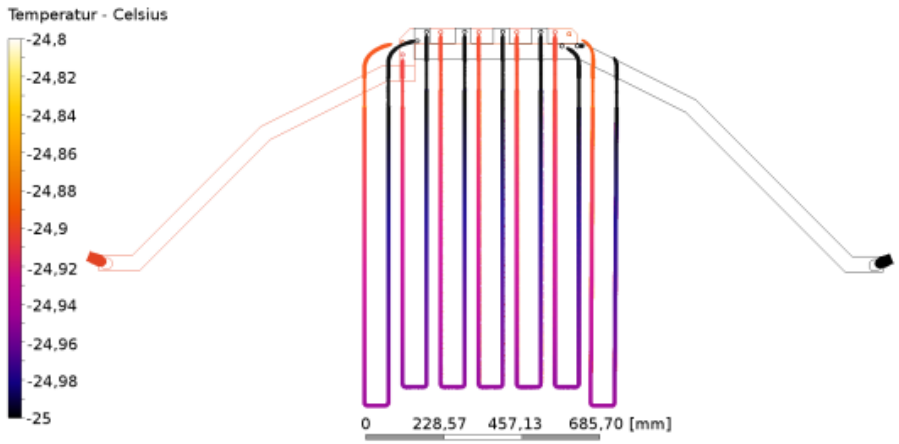
- All coolant pipings now prepared to go to passivation (KSO Edelstahlbeizerei GmbH, Wilnsdorf)
- As soon as we get the passivated pipes back we can run coolant flow tests according to simulation (C. Schnier)
- Last task to be done in Bochum before backplate and frame will be shipped to Jülich



Coolant Flow Simulation

- Simulation of coolant flow through backplate and resulting temperature profile at maximum electronics power dissipation (Claudius Schnier)

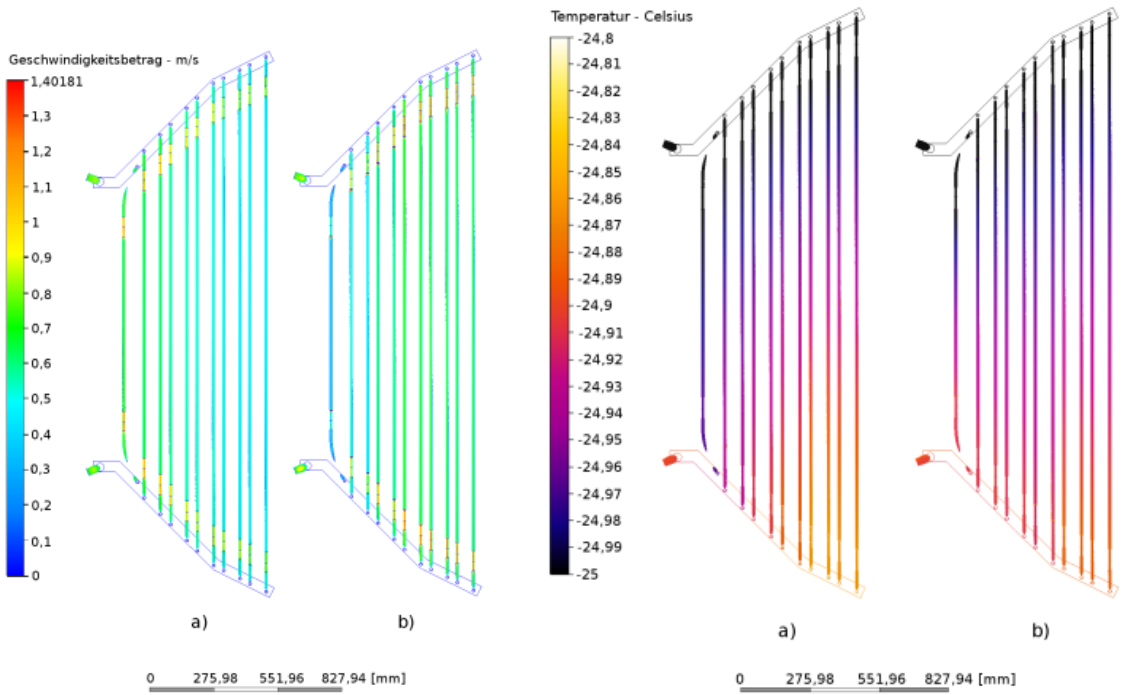




- Circuit on top/below beam pipe hole: Equal piping drill lengths, no individual flow adjustment necessary
- In-/outlet temperature difference less than 0.1 K, flow of 52 l/min, pressure drop 366 mbar

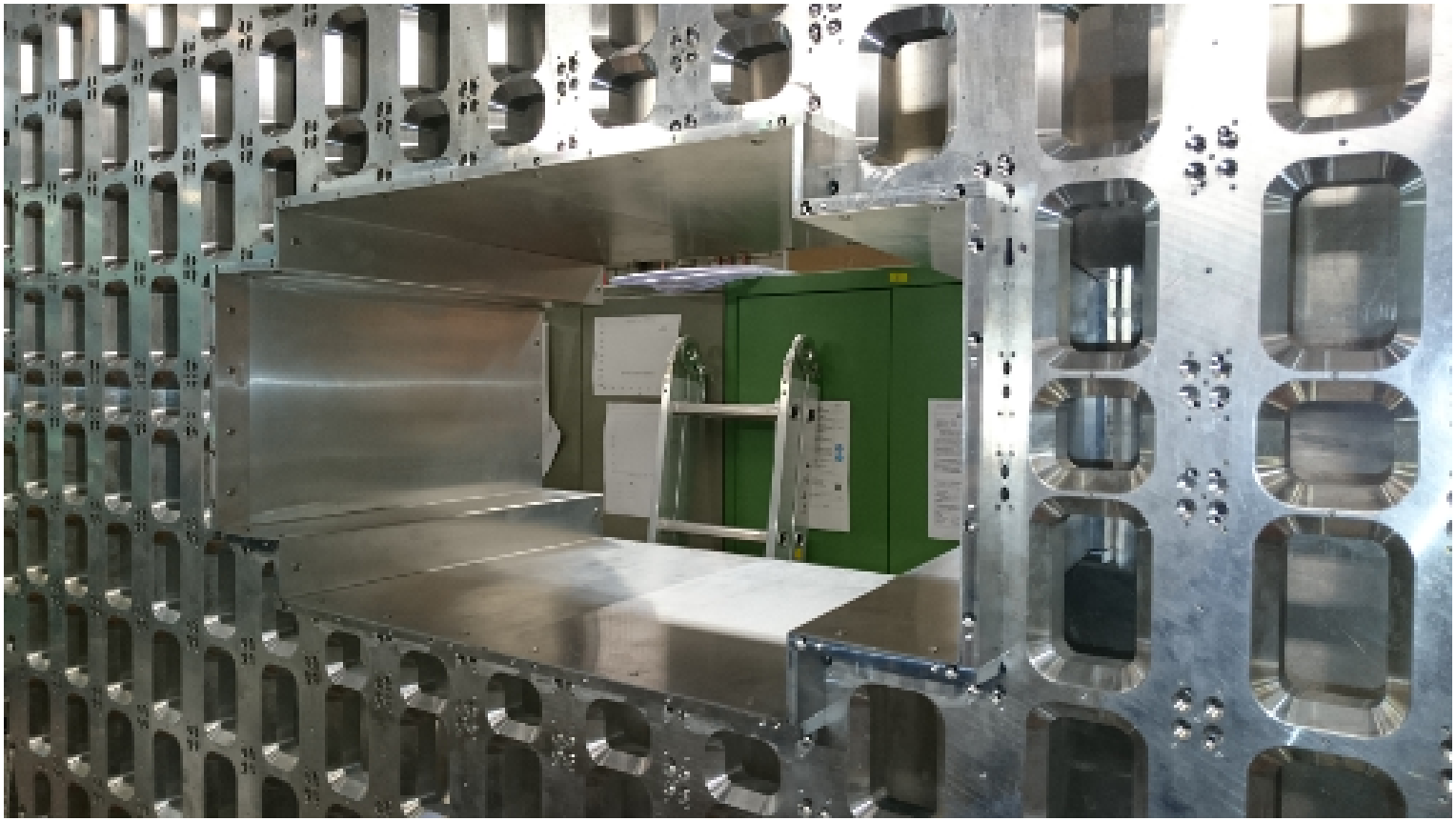
Cooling Flow Simulation

- Circuit backplate side regions: Calibrated holes in copper disks sealing coolant hose joints to backplane piping drills
- a) no flow adjustment b) adjustment by hole diameter
- In-/outlet temperature difference 0.1 K,
  flow of 40 l/min, pressure drop 120 mbar



Inner Stiffener Ring

- “Inner Stiffener Ring” completed:
  Inner closing of cold volume (beam surrounding)
- 0.8 mm aluminum sheets folded (2 identical parts)

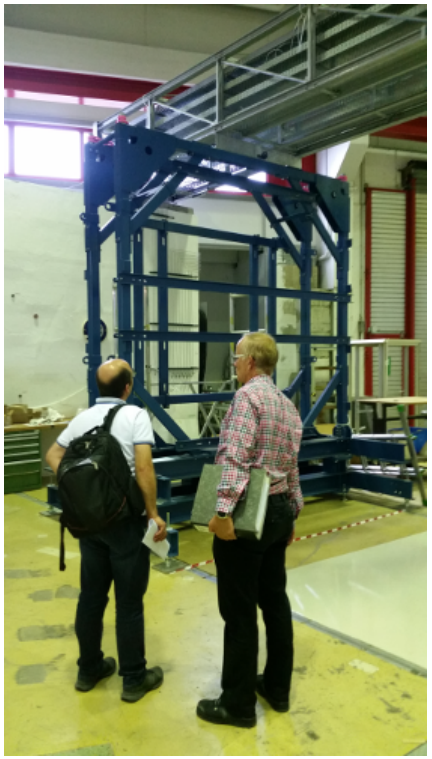


Preparation of Submodule Mounting in Jülich

- All 54 VPTT submodules built and currently stored in Bonn, will go to Jülich in one batch when tests are finished

Preparation of Submodule Mounting in Jülich

- Forward endcap support frame and pedestal fixed in place in Cosy TOF hall
- Manipulator arm (CMS): Repair ongoing, submodule adapter design (J. Colienne, FZJ)

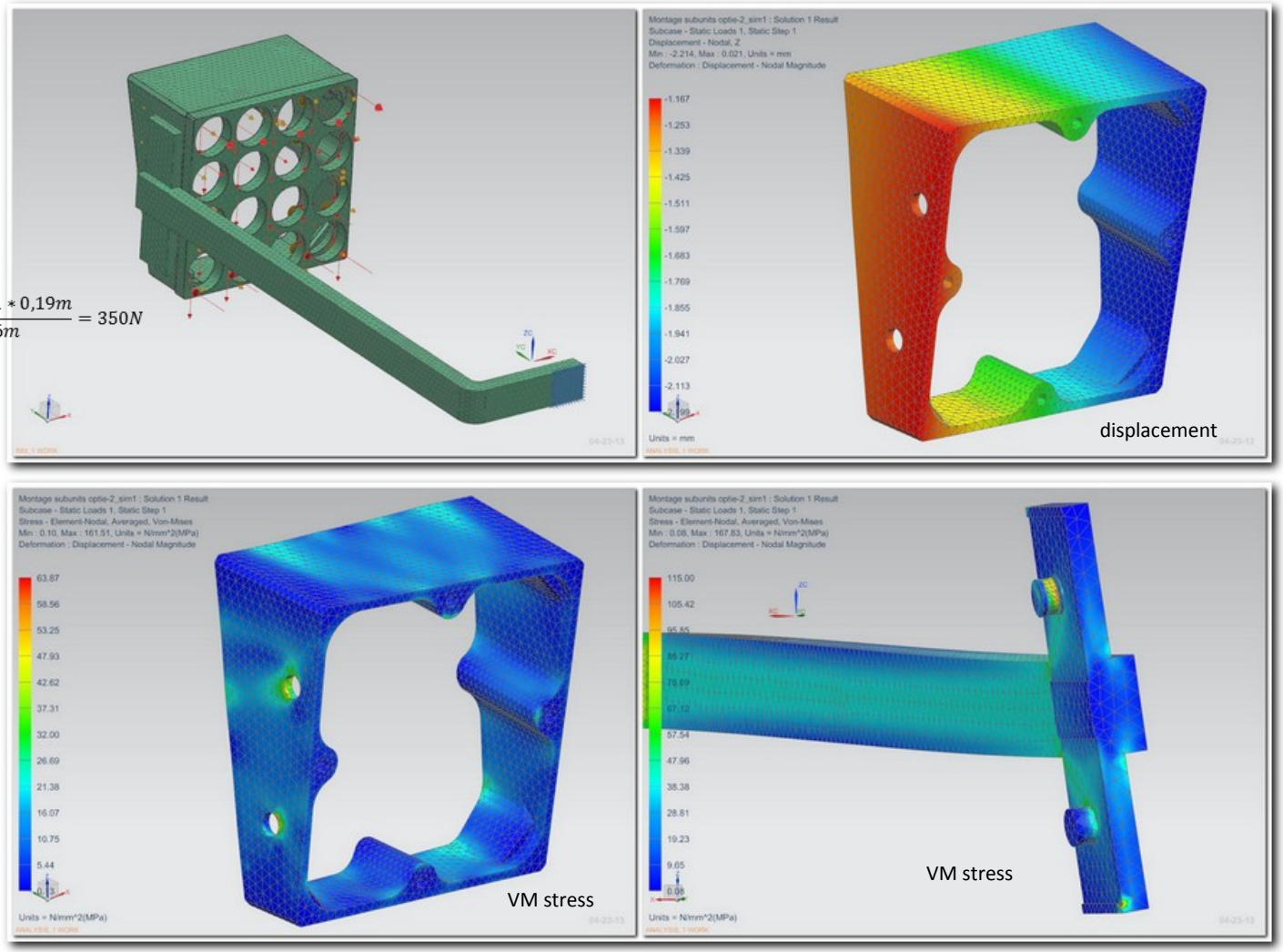




Preparation of Submodule Mounting in Jülich

Mounting subunits

Stress & displacement in interface when subunit (18kg) is carried by manipulator

$$\frac{18kg * 9{,}81 * 0{,}19m}{0{,}096m} = 350N$$



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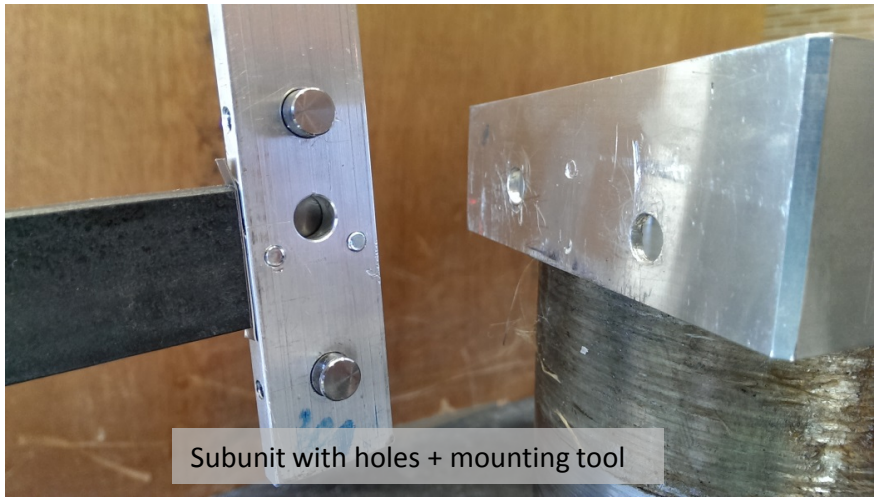
Preparation of Submodule Mounting in Jülich

Mounting subunits

Mounting tool to hold the subunits when mounting

Subunit hanging on mounting tool



Subunit with holes + mounting tool

Subunit with counter weight