Position Measurements of Submodules on the FWEC

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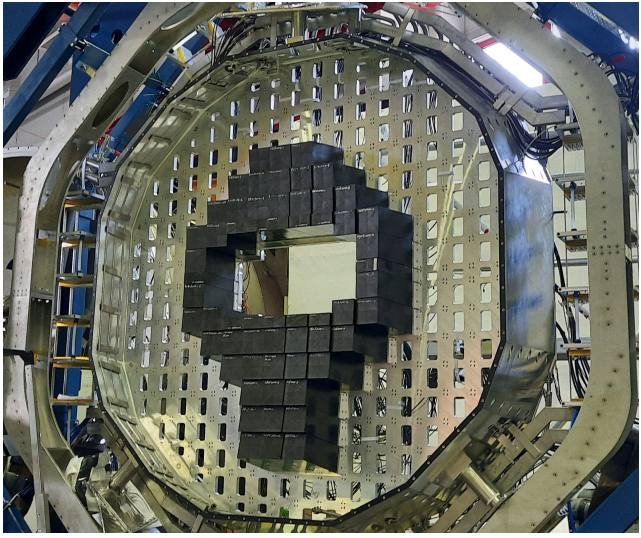
Mounted Submodules



- 54 VPTT submodules
- 6 APD submodules
- 864 crystals
- Mass $>1\,\mathrm{t}$

- Staggered mounting
- Gap between submodules: $\approx 1\,\mathrm{mm}$

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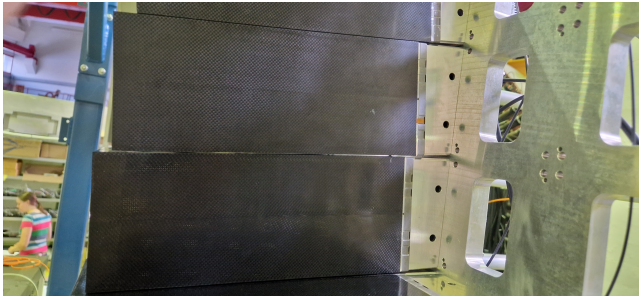

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Leica AT-960, T-Probe and T-Scan

Leica AT-960LR Lasertracker

- Position measurement with reflector, T-Probe or T-Scan
- Accuracy $\pm 15\,\mu m \pm 6\,\mu m/m$
- Range 40 m

Leica T-Probe

- Different measurement tips available
- Accuracy $\pm 35\,\mu m$

Leica T-Scan

- Laserscanner for surface measurements
- Accuracy $\pm 60\,\mu m$

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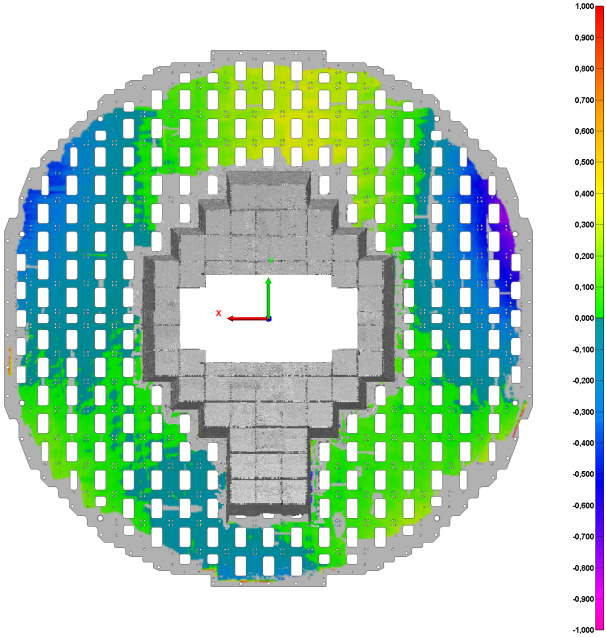
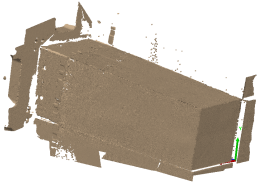
Scan of Forward Endcap



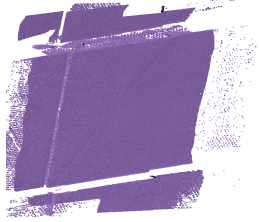
- Most of the backplate scanned
- Each submodule scanned individually
- About 4 GB of compressed data
- Almost 70 000 000 points

Scan of Forward Endcap

1-X4Y2



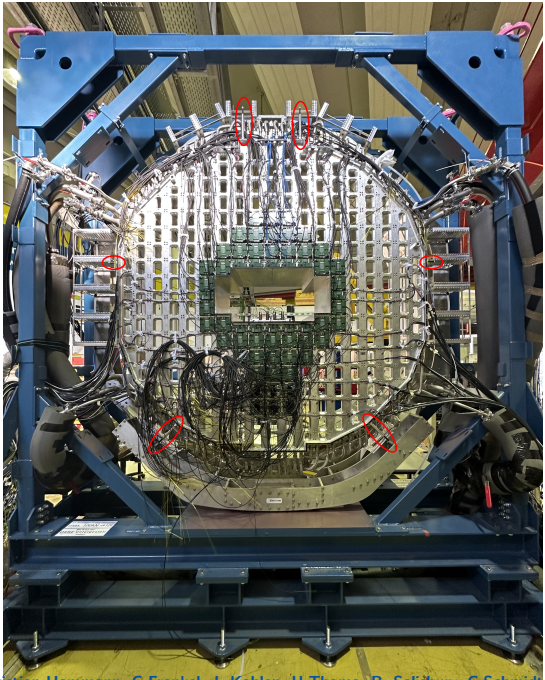
1-X0Y3



- Most of the backplate scanned
- Each submodule scanned individually
- About 4 GB of compressed data
- Almost 70 000 000 points

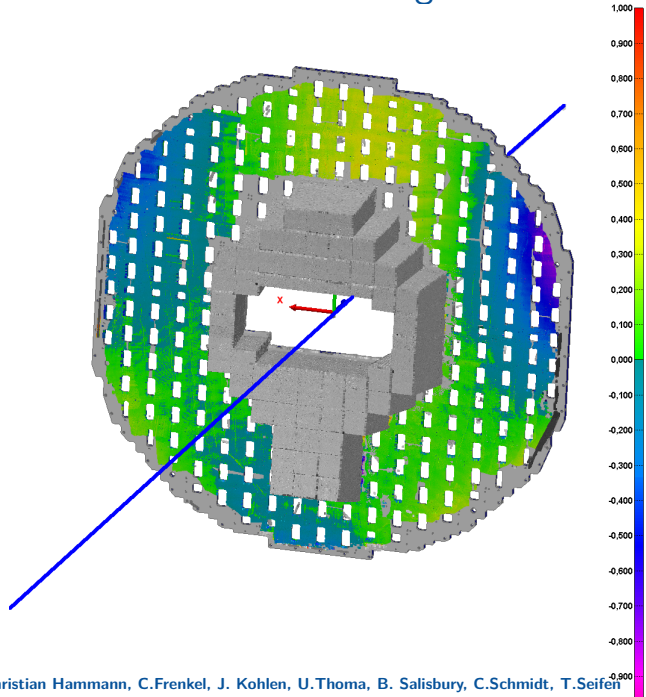
- Scan of each submodule needs to be cleaned up manually
- Only few points on the side for submodules on center row

Reference Features



- Six reference features
- Designed for 1/2 inch spheres
- Measured with T-Probe
- Visible from the back of the FWEC
- Accessible with insulation
- Measure shrinkage after cooldown

Alignment to Beam Axis



- Markings in the COSY-TOF hall for beam axis
- Markings have been picked up with T-Probe during measurements
- Beam axis has been reconstructed in the coordinate system of FWEC

- 7 mm too high
- 5 mm to the left
- Perpendicular to the beam

Summary and Outlook

- Alignment of the FWEC to the beam has been determined
- Surface of submodules on the FWEC has been measured
- Data available to determine positions of submodules

- Cool down FWEC
- Measure shrinkage/position shift
- Extract positions of submodules
- Implement in simulation