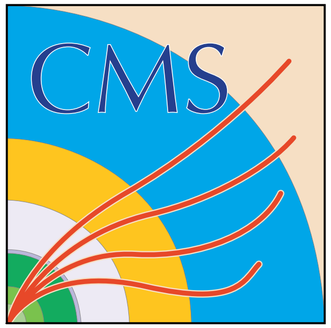
Novel Engineering Techniques



Andreas Mussgiller
for WP *Novel Engineering Techniques, Advanced Material and Interconnects*

16/12/2020

with material from *DESY FS-DS*, *DESY ATLAS* and *DESY CMS*

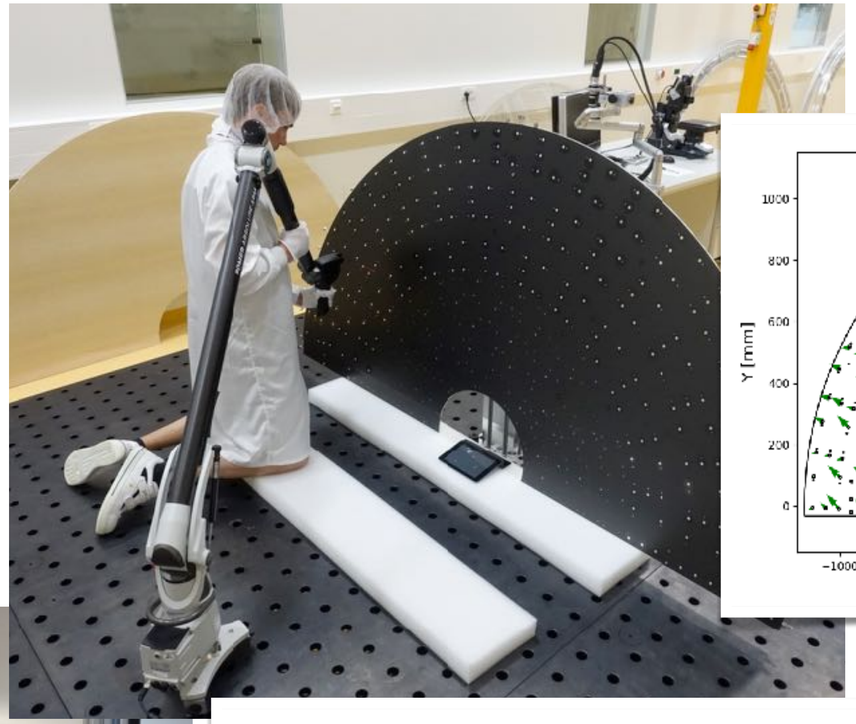
HELMHOLTZ
RESEARCH FOR GRAND CHALLENGES

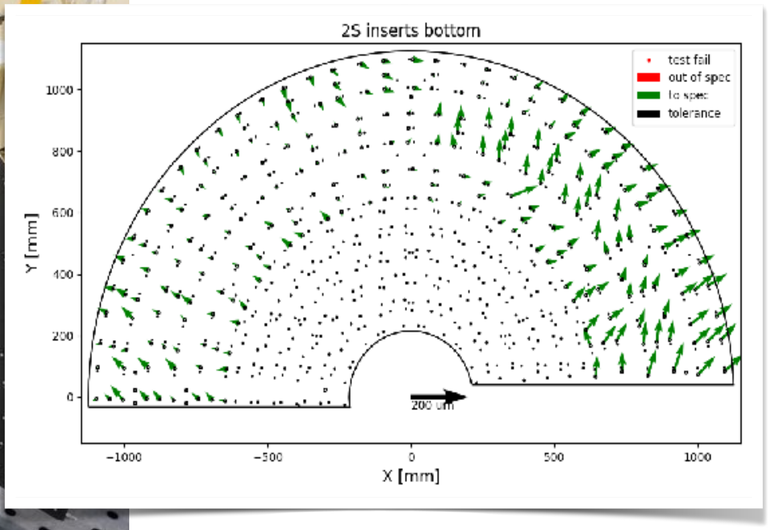
DESY.

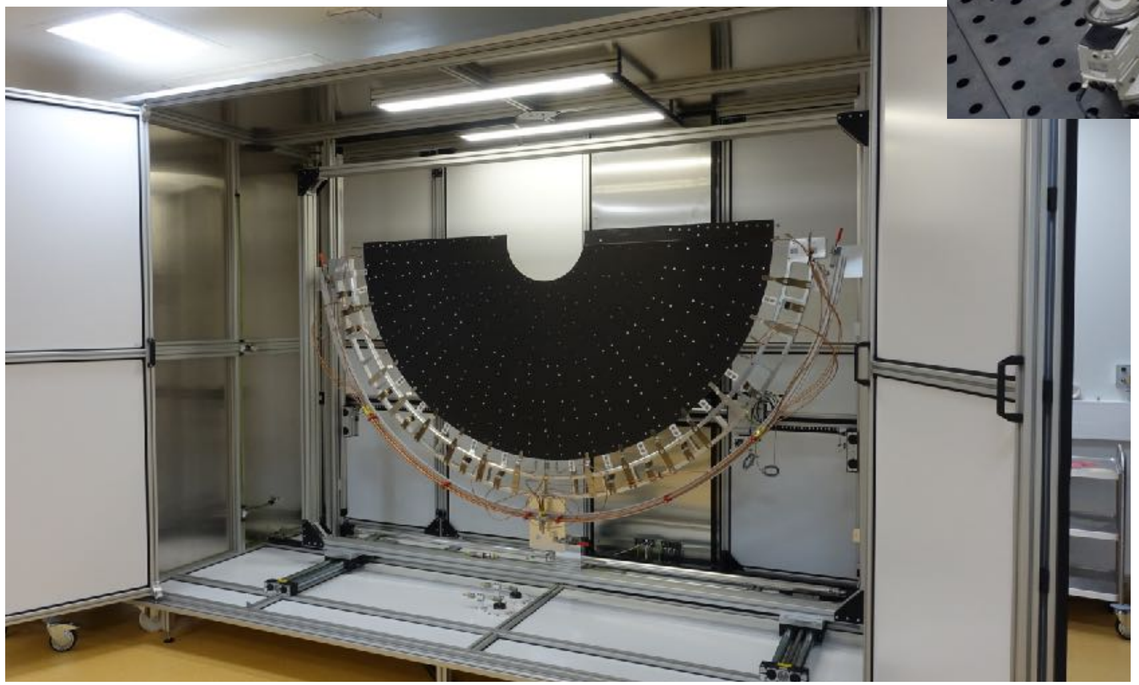
Local Support Structures

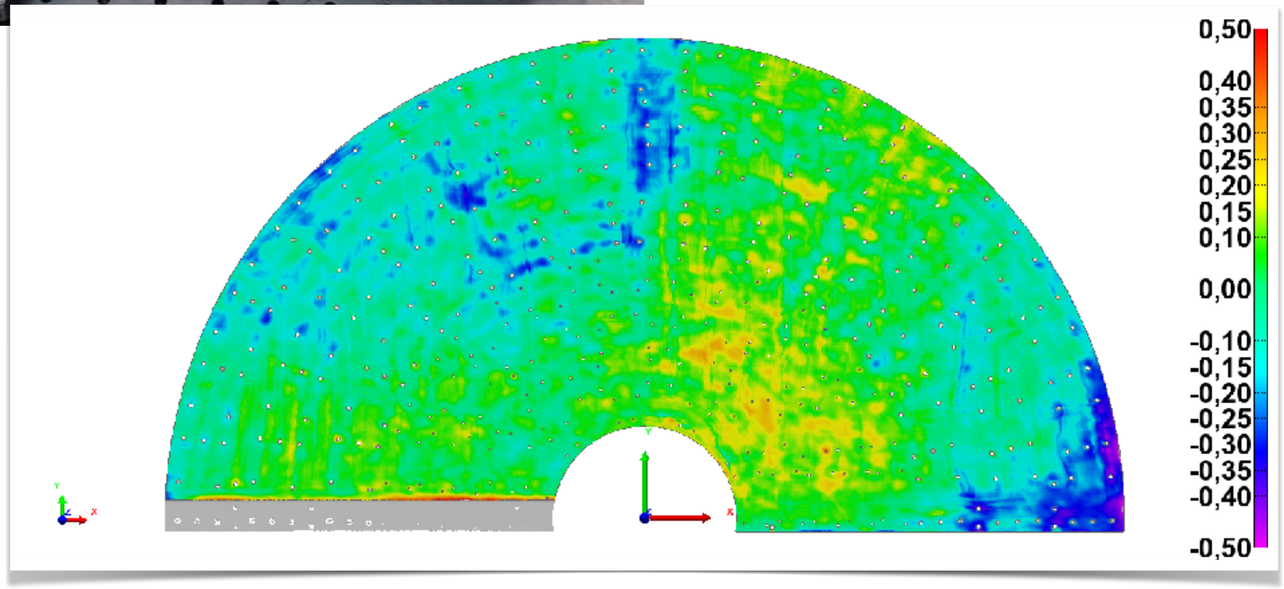
CMS Full-Sized Dee Prototype

- First prototype Dee manufactured in industry and delivered earlier this year
- Extensively tested in the past month
  - metrology and laser scans
    - insert positions mostly within specs
    - flatness within specifications
  - thermal testing (IR) will be next

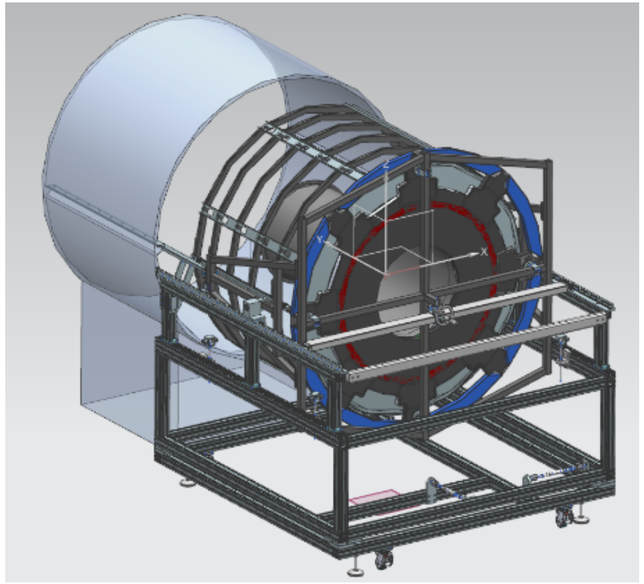








Integration Tooling

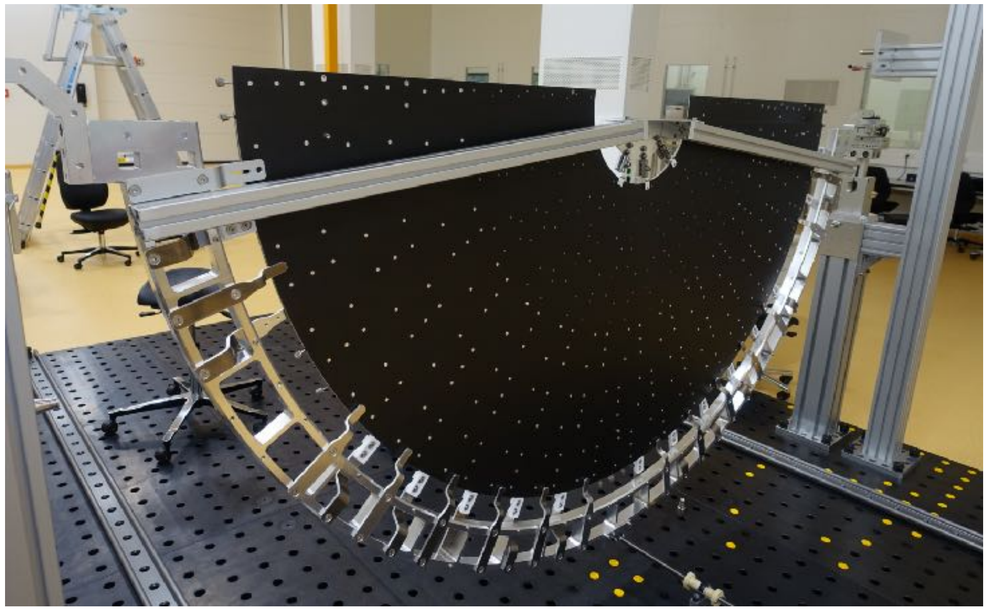


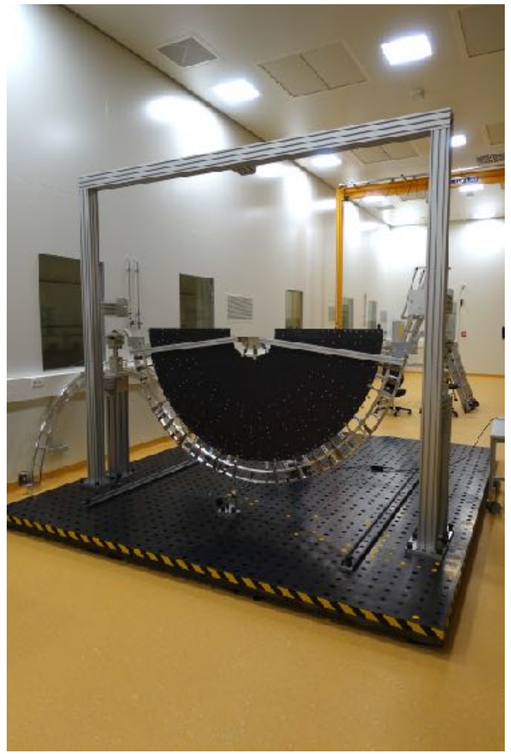
ATLAS Strips Endcap Integration Tooling

- Design and construction of precision tooling for Endcap integration activities
  - insertion of petals into global structure
  - transport and rotation of endcap structure
  - insertion of endcap in ITk Outer Cylinder

CMS TEDD Integration

- Tooling for
  - Disk assembly (Dee to Dee)
  - Double-Disk assembly (Disk to Disk)
- Will be tested with dummy Dees made of plexiglass as next step
- Real integration tests with prototype Dees delayed due to pandemic
  - One prototype Dee from DESY and one from Lyon

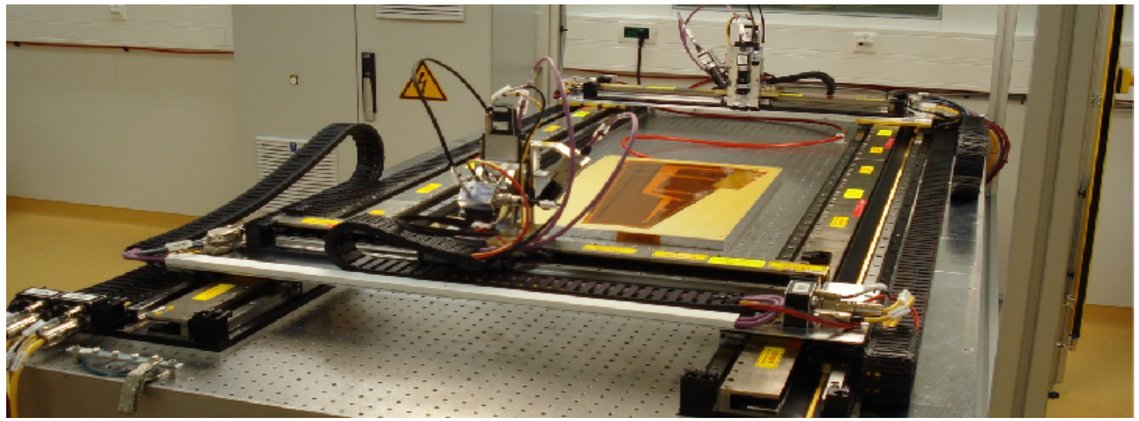


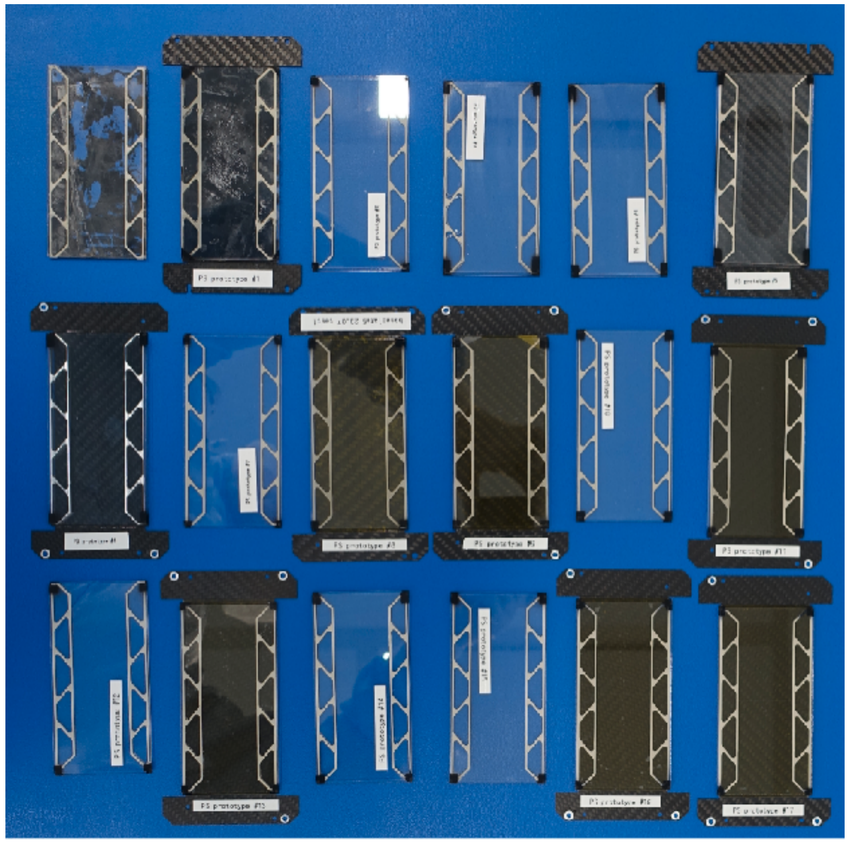


Automation

ATLAS Bus Tape Testing Robot

- In-house manufacture of setup for the electrical testing of petal bus tapes
- Two synchronous X-Y-Z stage systems fully automated
  - allows for high-speed differential measurements

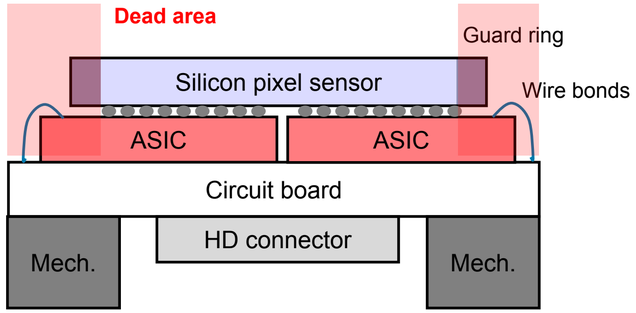


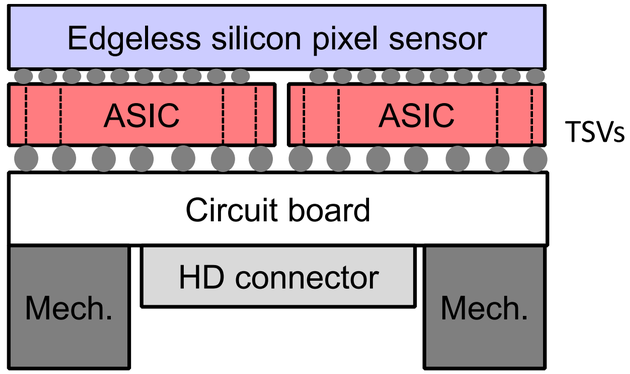


CMS PS Module Automated Assembly

- Precision assembly of pT trigger modules
- Based on X-Y-Z stage, vision and vacuum systems
- O(20) dummy modules built to specifications
- Process optimized to reach target throughput of four modules per day
- Setup is in the meantime also used at Brown U and FNAL

Micro Channel Cooling for Photon Detectors





- Motivation
  - reduce the complexity
  - more robust systems
  - reduce the dead areas by using TSVs
- Micro channel cooling demonstrator based on silicon interposer with
  - redistribution layer (RDL) and
  - integrated micro channels (MCC)
- Collaboration agreement/contract with CNM Barcelona signed for production of prototypes
- Connectivity solved for conventional fluid
  - reliability needs to be improved
- Interest from HEP to improve connectivity further to allow use with CO2 cooling