

ATLAS UPGRADE

A photograph of a large, classical stone building under renovation. A crane is lifting a large, spherical object from the roof. Scaffolding is visible on the right side of the building. The sky is clear blue.

Tristan du Pree
Nikhef Jamboree
12 May 2026

ATLAS UPGRADE

ATLAS @ Amsterdam

- Recently renovated
 - 350 years
 - Dirty air
 - Ageing

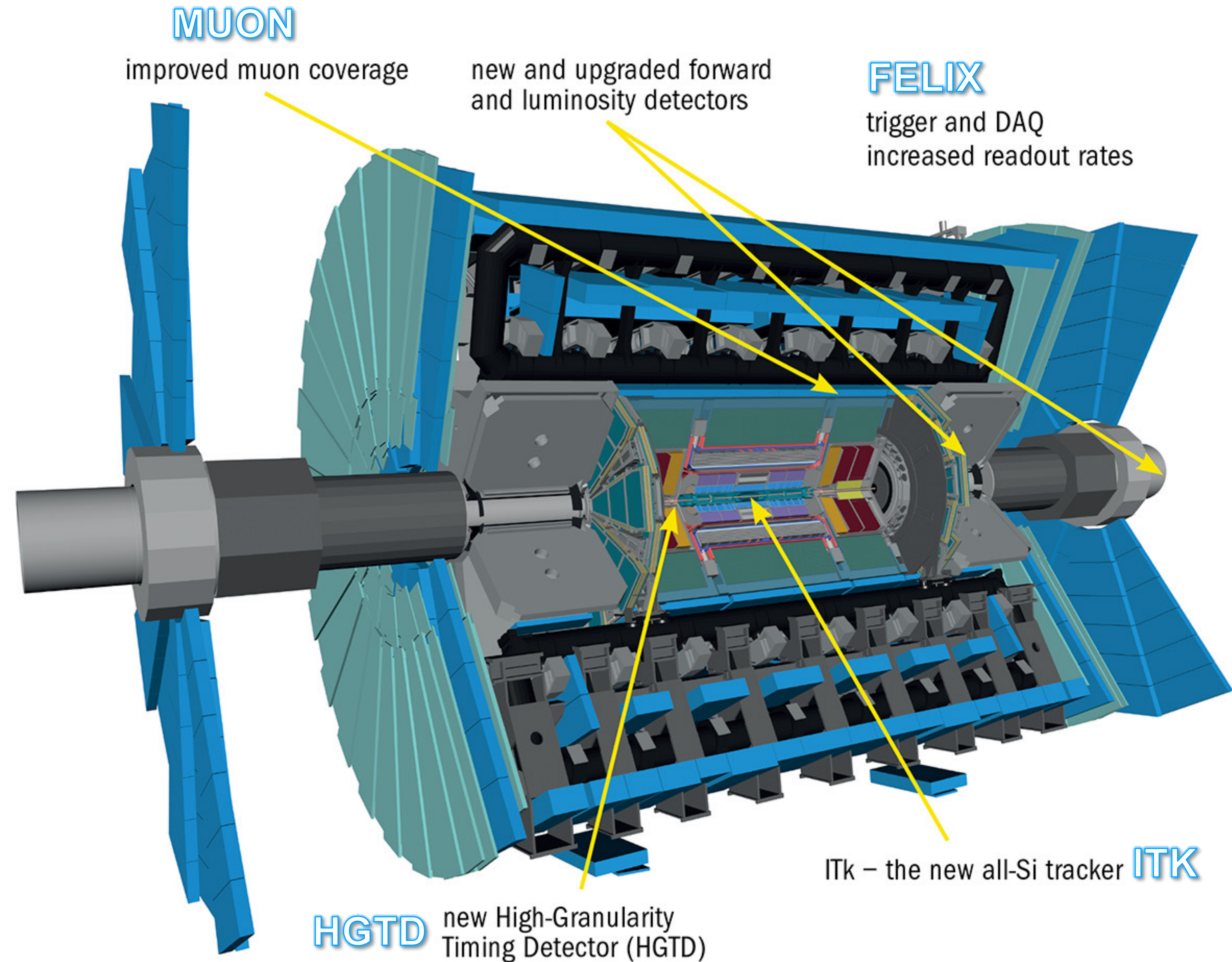
Royal Palace @ Dam Square, 1 May 2026



ATLAS UPGRADE

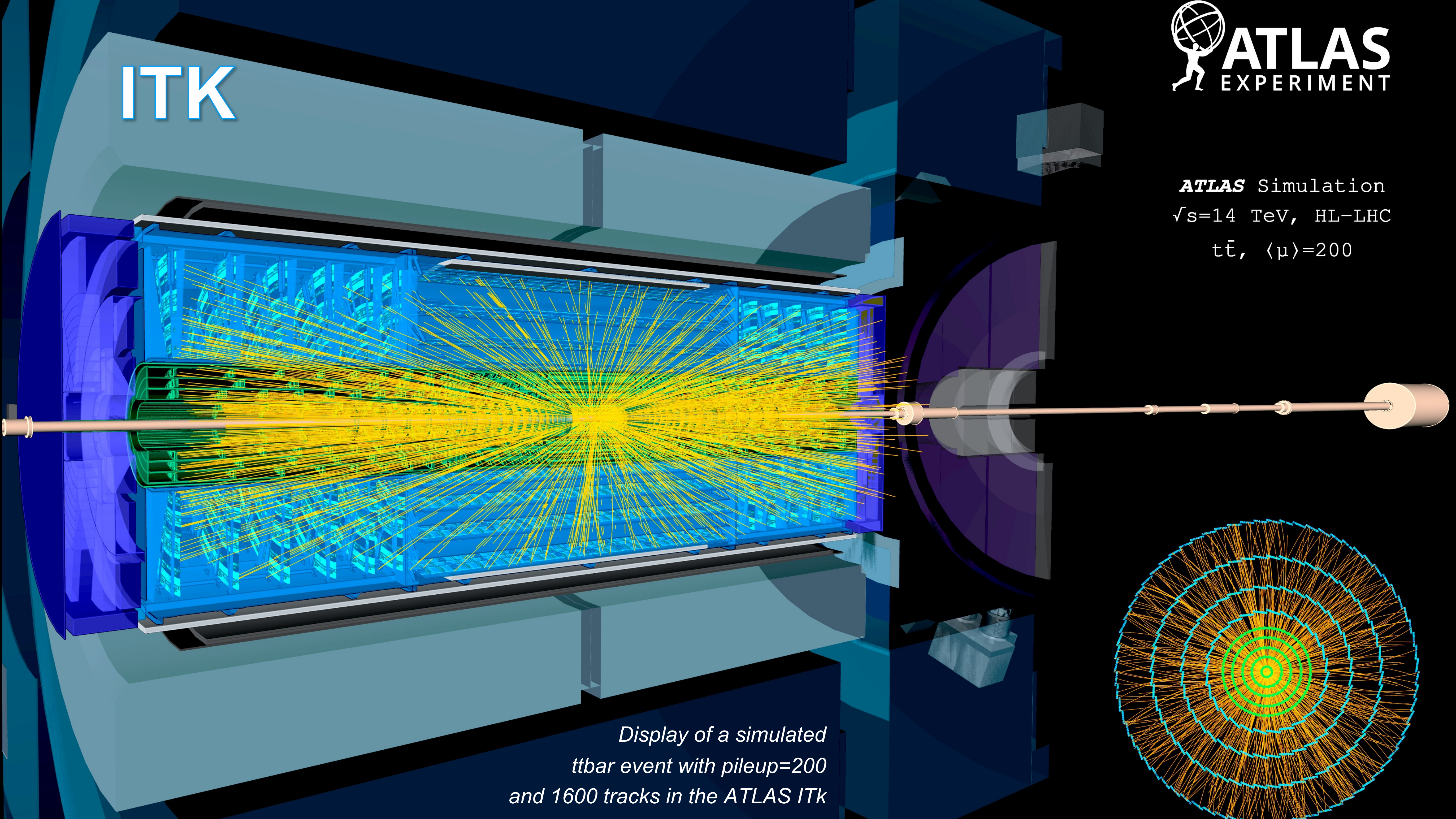
ATLAS @ CERN

- To be upgraded
 - >15 years
 - Radiation
 - Ageing



ITK

ATLAS Simulation
 $\sqrt{s}=14$ TeV, HL-LHC
 $t\bar{t}$, $\langle\mu\rangle=200$



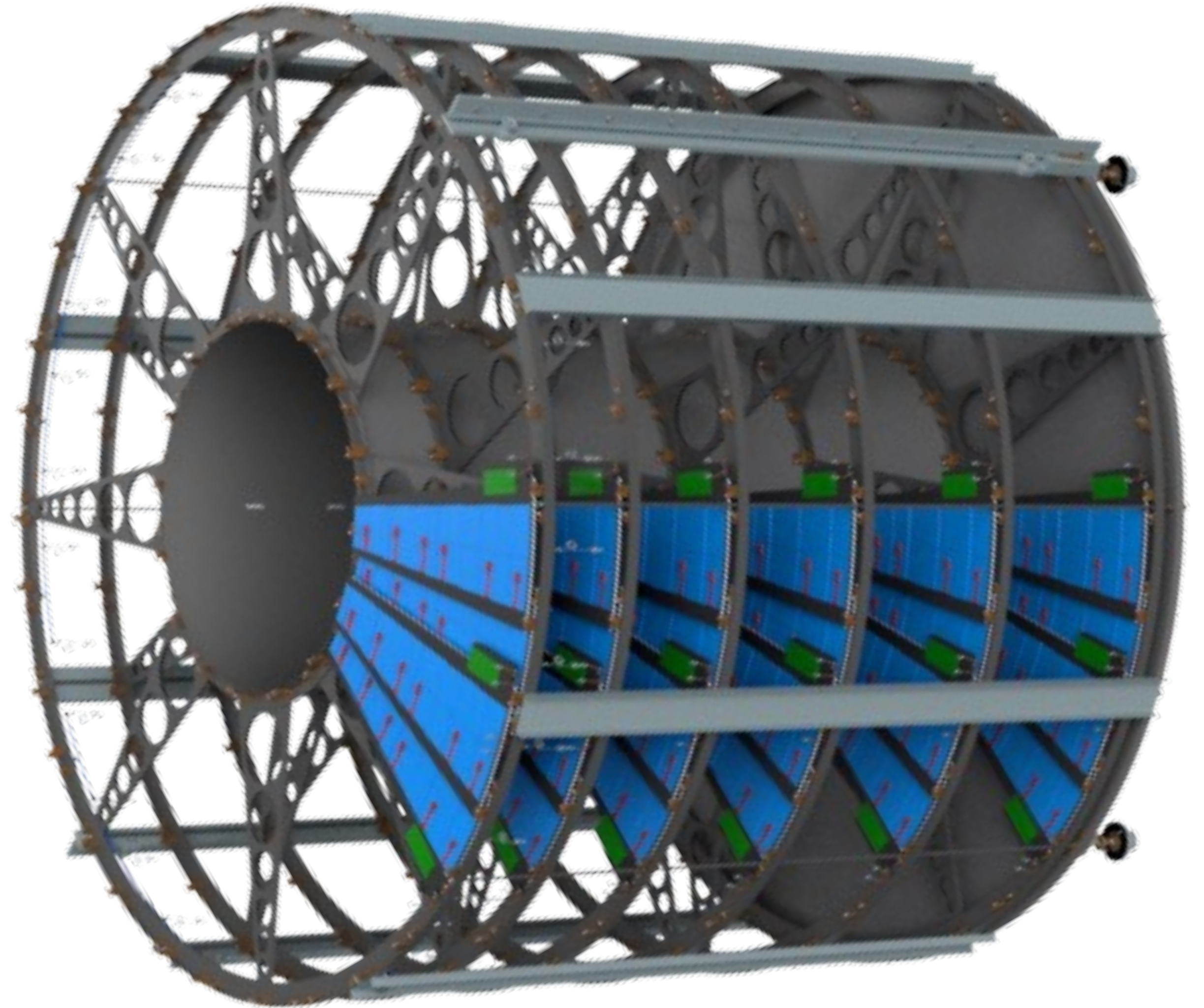
*Display of a simulated
ttbar event with pileup=200
and 1600 tracks in the ATLAS ITk*

ITK: ENDCAP STRUCTURES

Made at Nikhef

- Both ITk endcaps
- 1 shipped to DESY

Large+Light+Precise+Stable

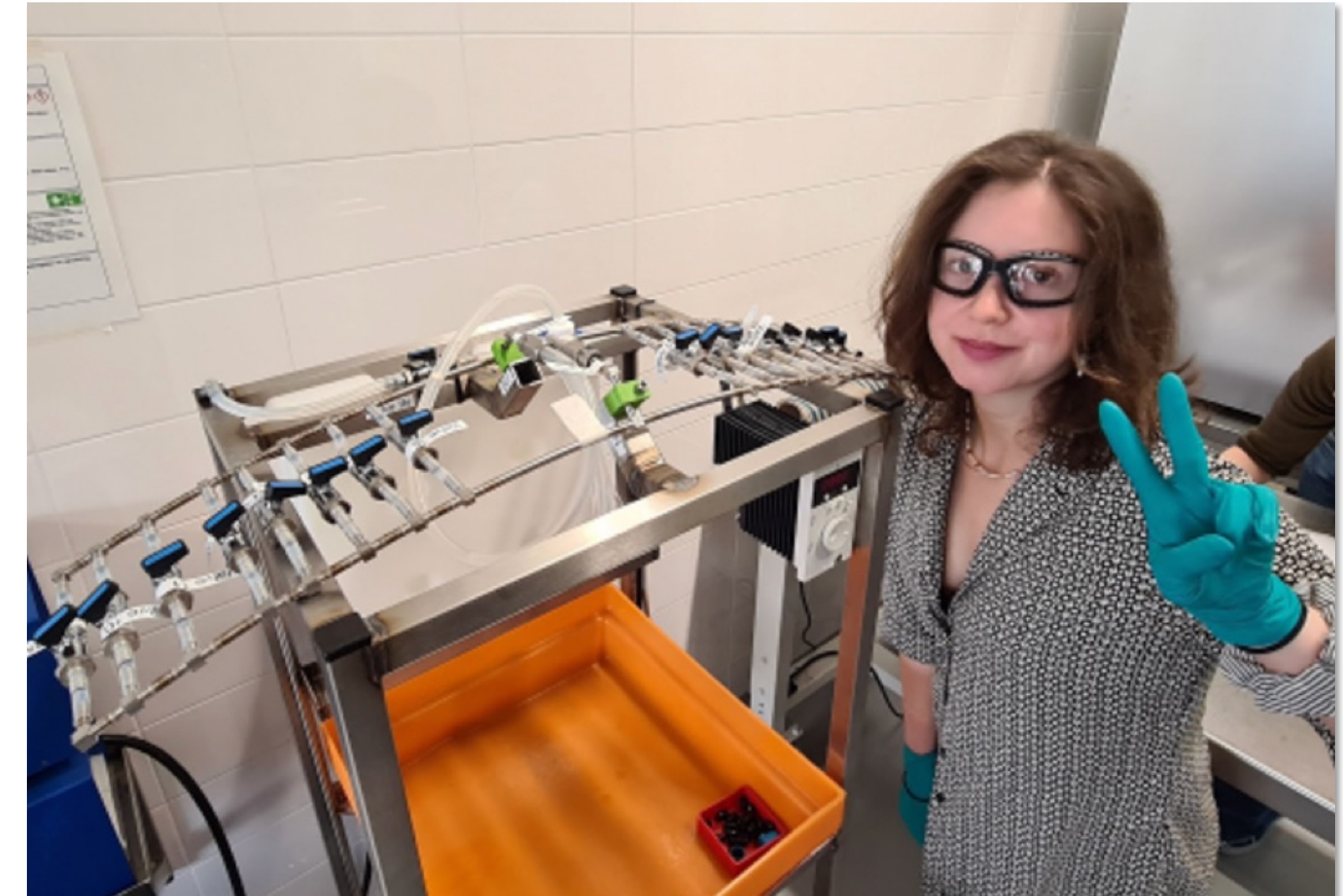


ITK: ACTIVITIES

PhD student

Workshop & cleanroom activities

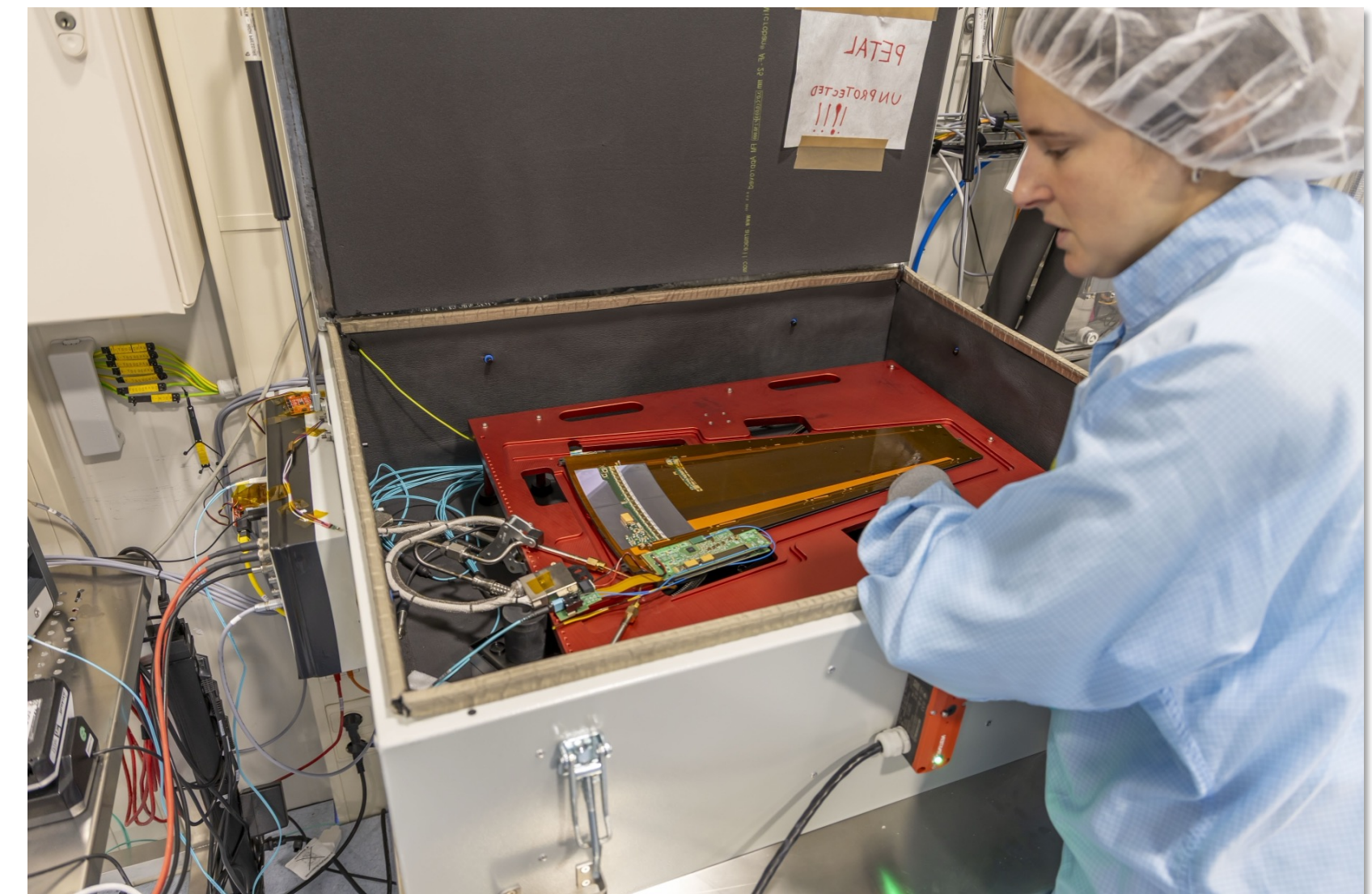
- Cooling, welding, etc
- Prepare for petal shifts
- Insertion, commissioning, tests



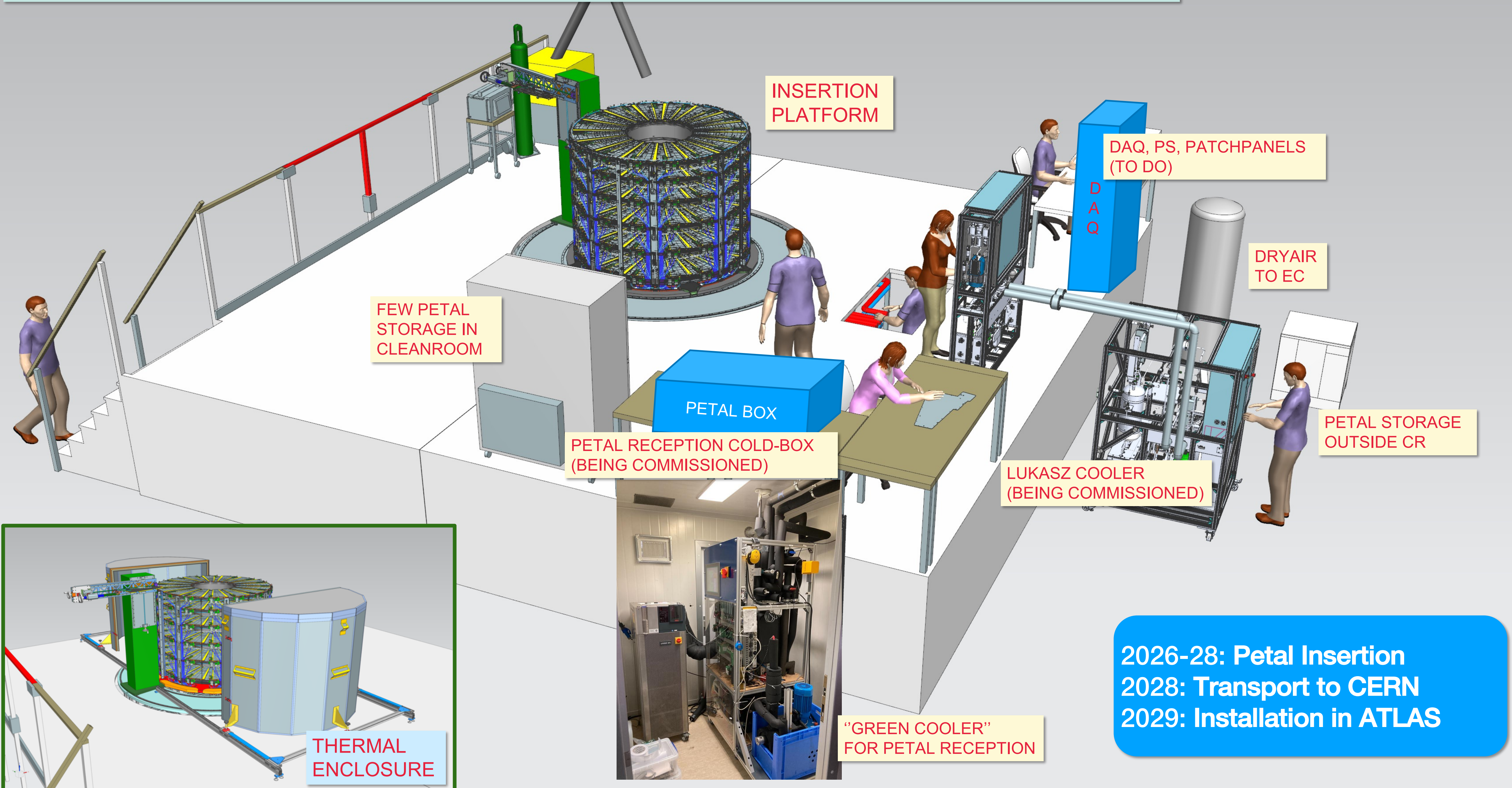
Technicians



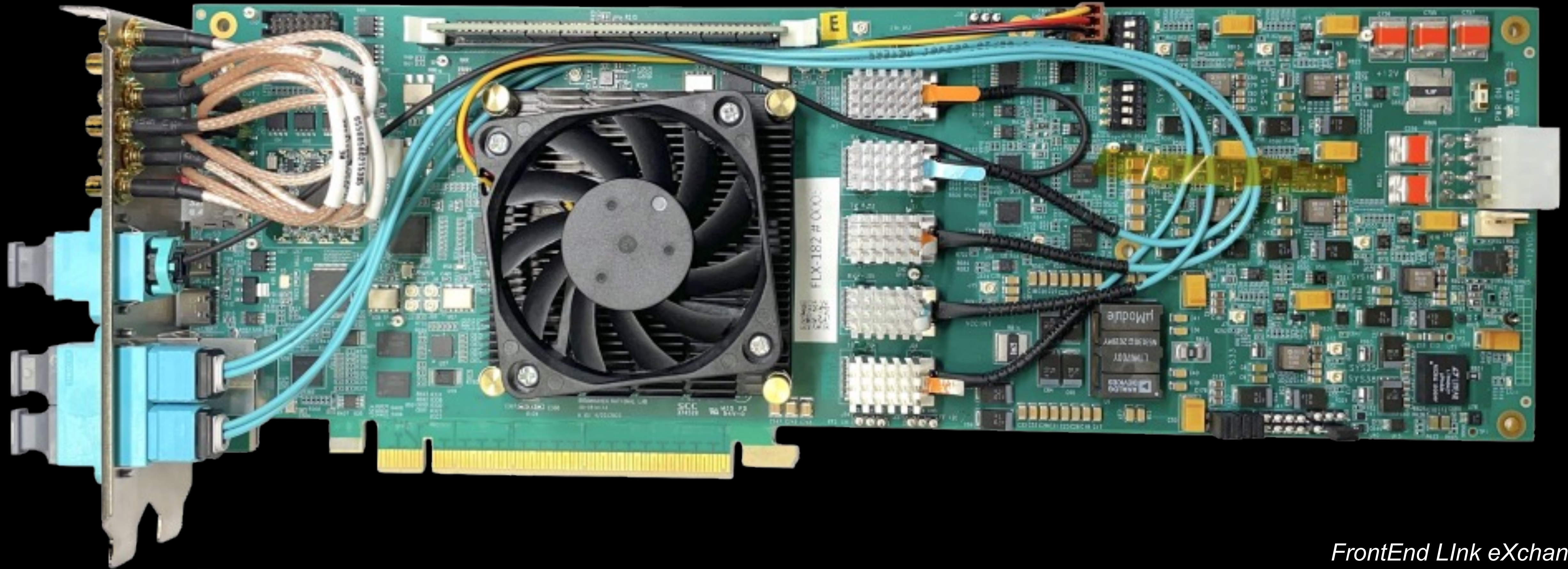
Postdoc



TARGET SUMMMER 2026: READY FOR PETALIZATION



FELIX



*FrontEnd Link eXchange
Readout system of the ATLAS experiment*

FELIX INTRO

HL-LHC: more data

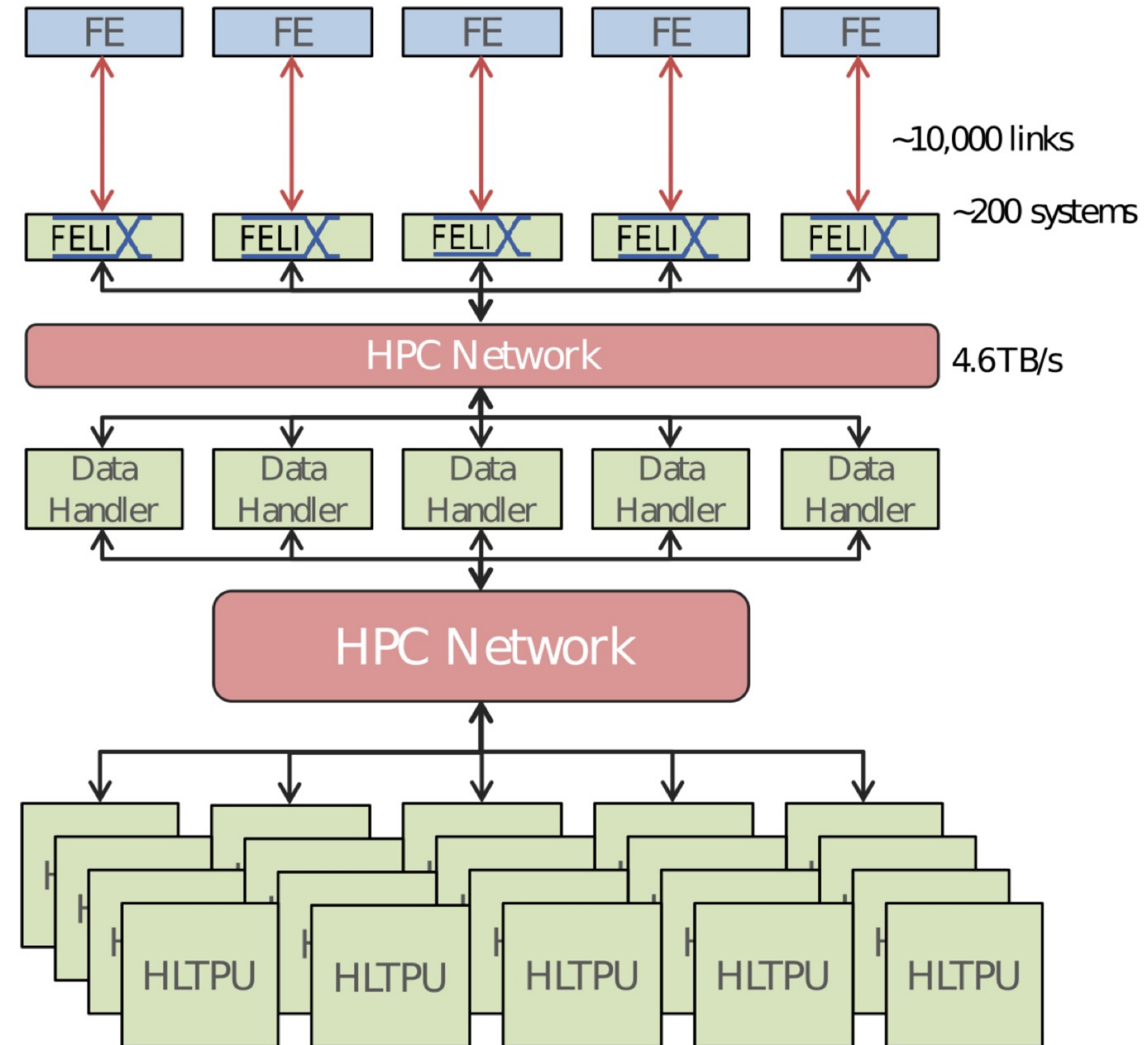
- x10 trigger rate
 - 1MHz
- x3 interactions
 - 200 pileup
- x20 readout rate
 - 4.6 TB/s

New readout chain

- Trigger, clock, data acquisition



Felix & Frans @ CERN



FELIX STATUS

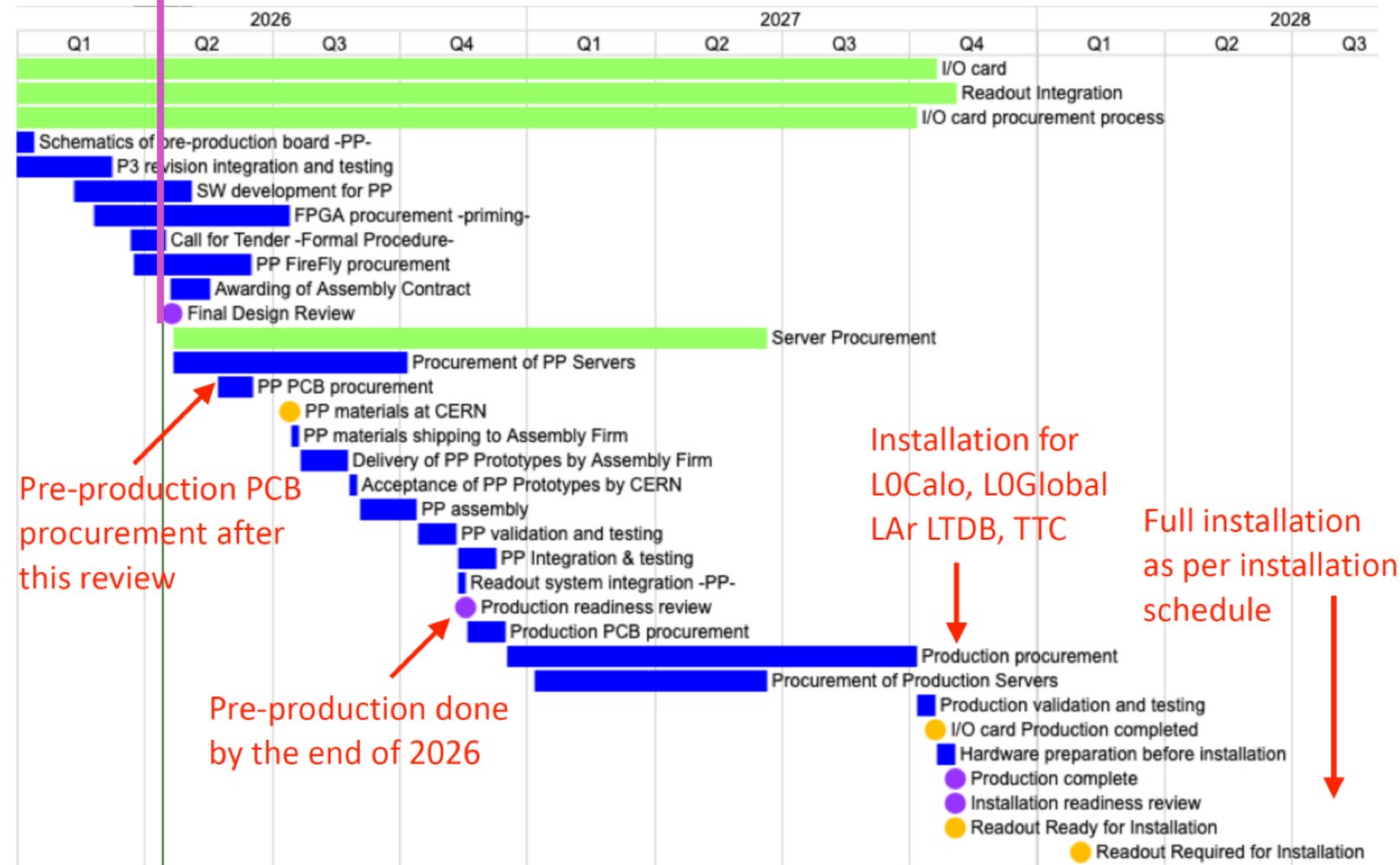
Timeline

- 22 April
- FDR!
- 2026
- Pre-production
- 2027-2028
- Full installation

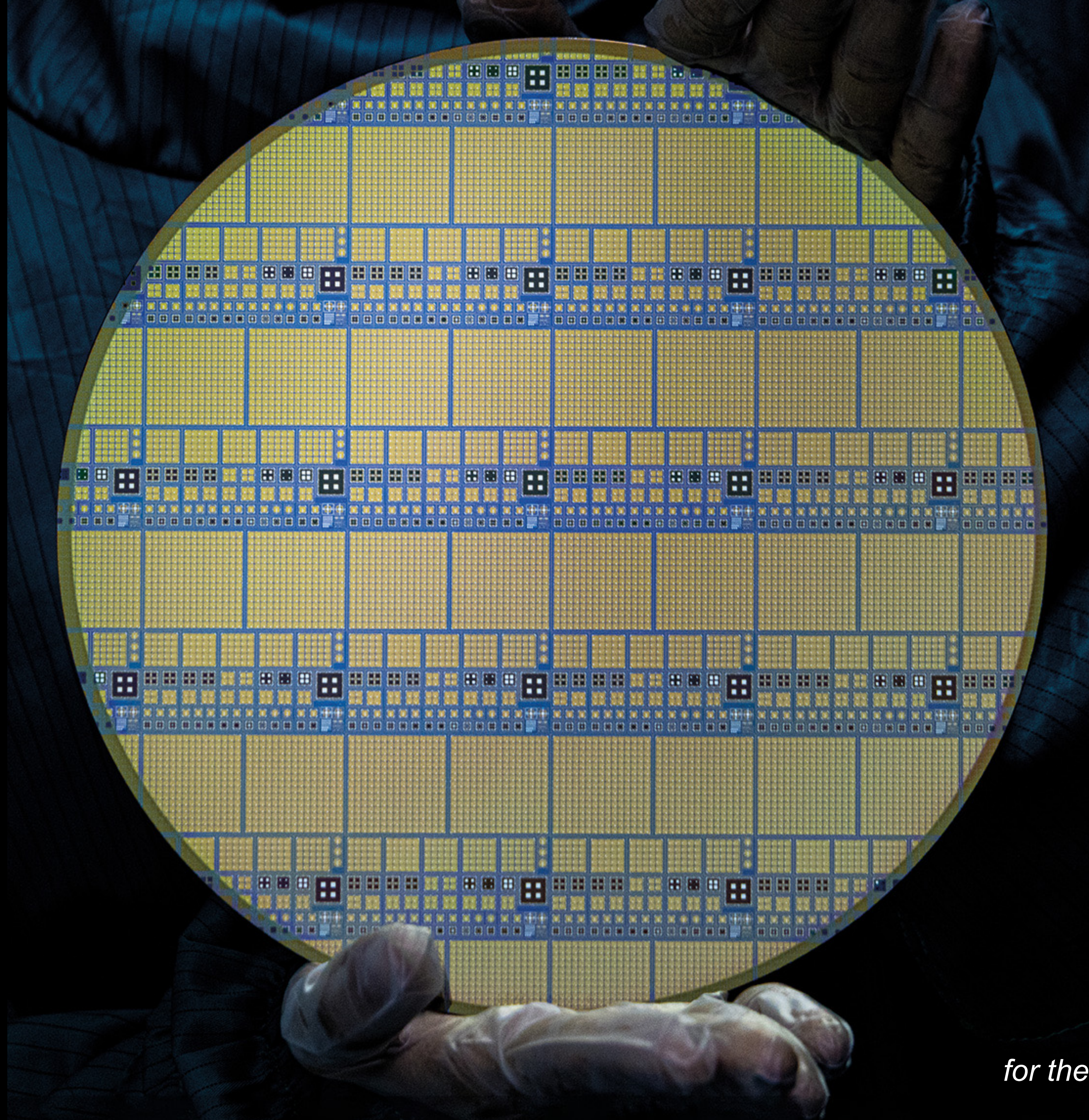
Procurement ongoing

- FPGA, FireFly, PCB
- Assembly & Servers

Crucial Milestone was on April 22 2026: Final Design Review!



HGTD



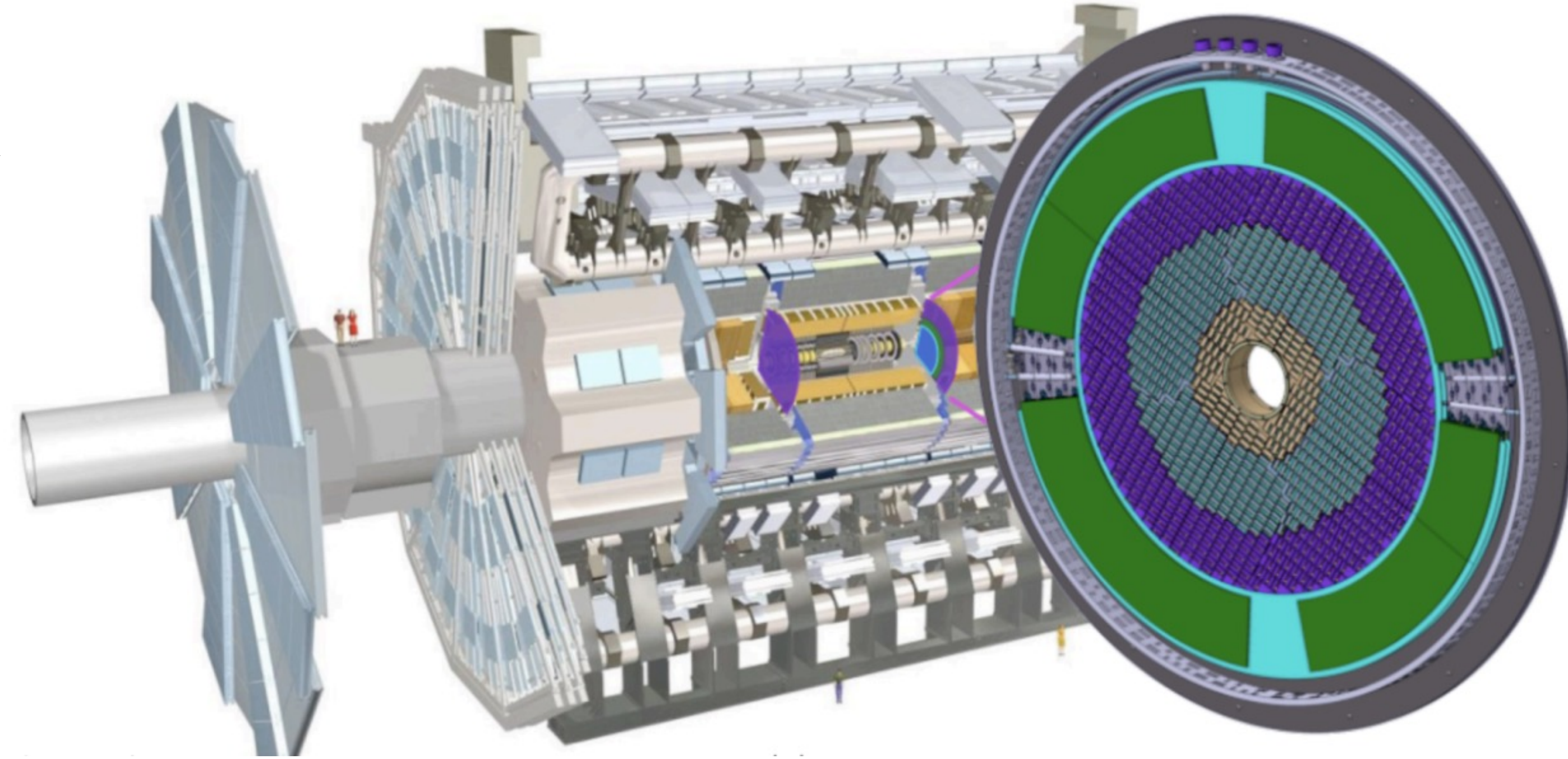
*8-inch prototype wafer
of low-gain avalanche diodes
for the High-Granularity Timing Detector*

HGTD INTRO

High Granularity Timing Detector

- Forward region
 - $2.4 < |\eta| < 4$
- Timing information
 - 30-50 ps

Handle pileup=200 in HL-LHC!



Nikhef 'Fastrack'



HGTD STATUS

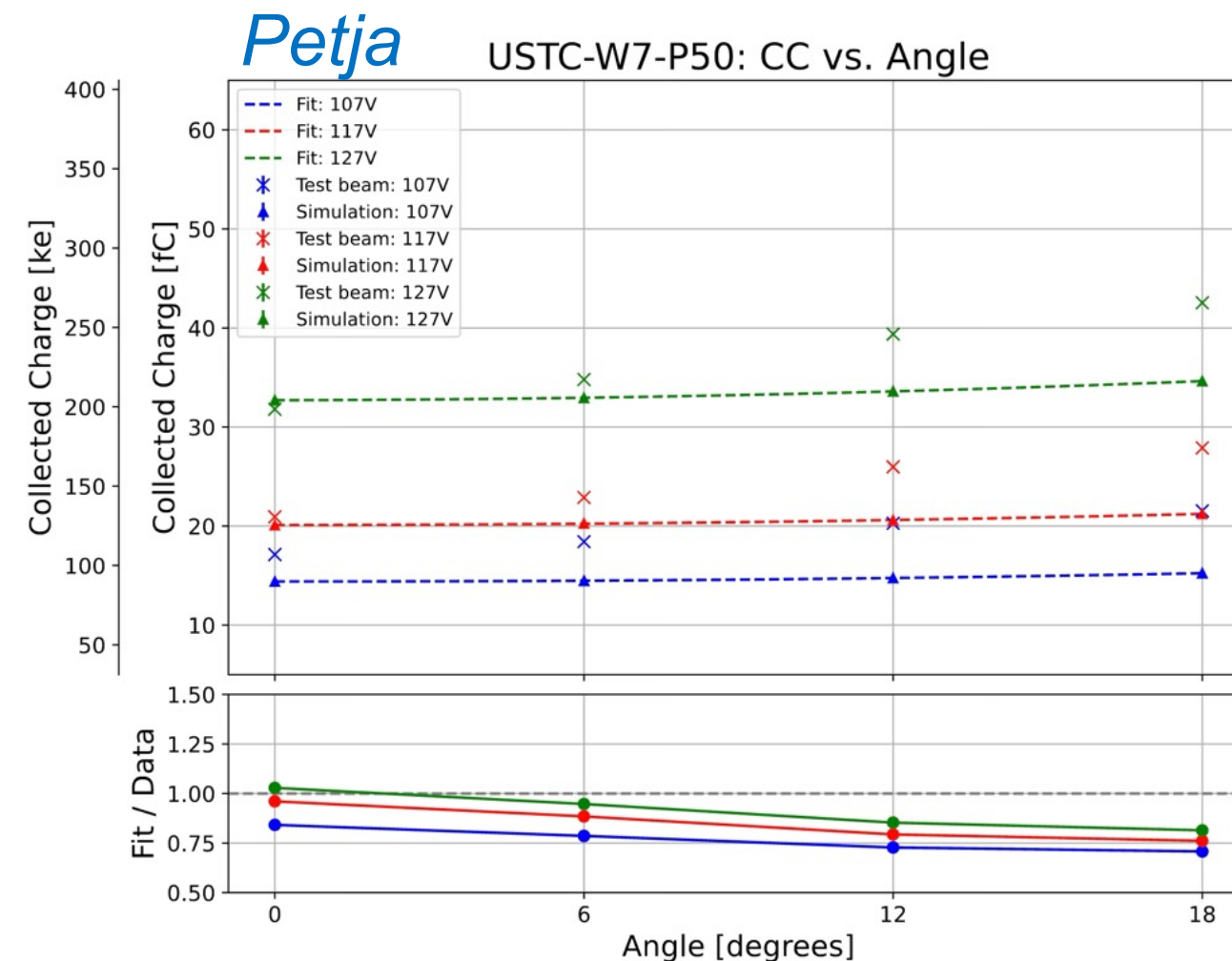
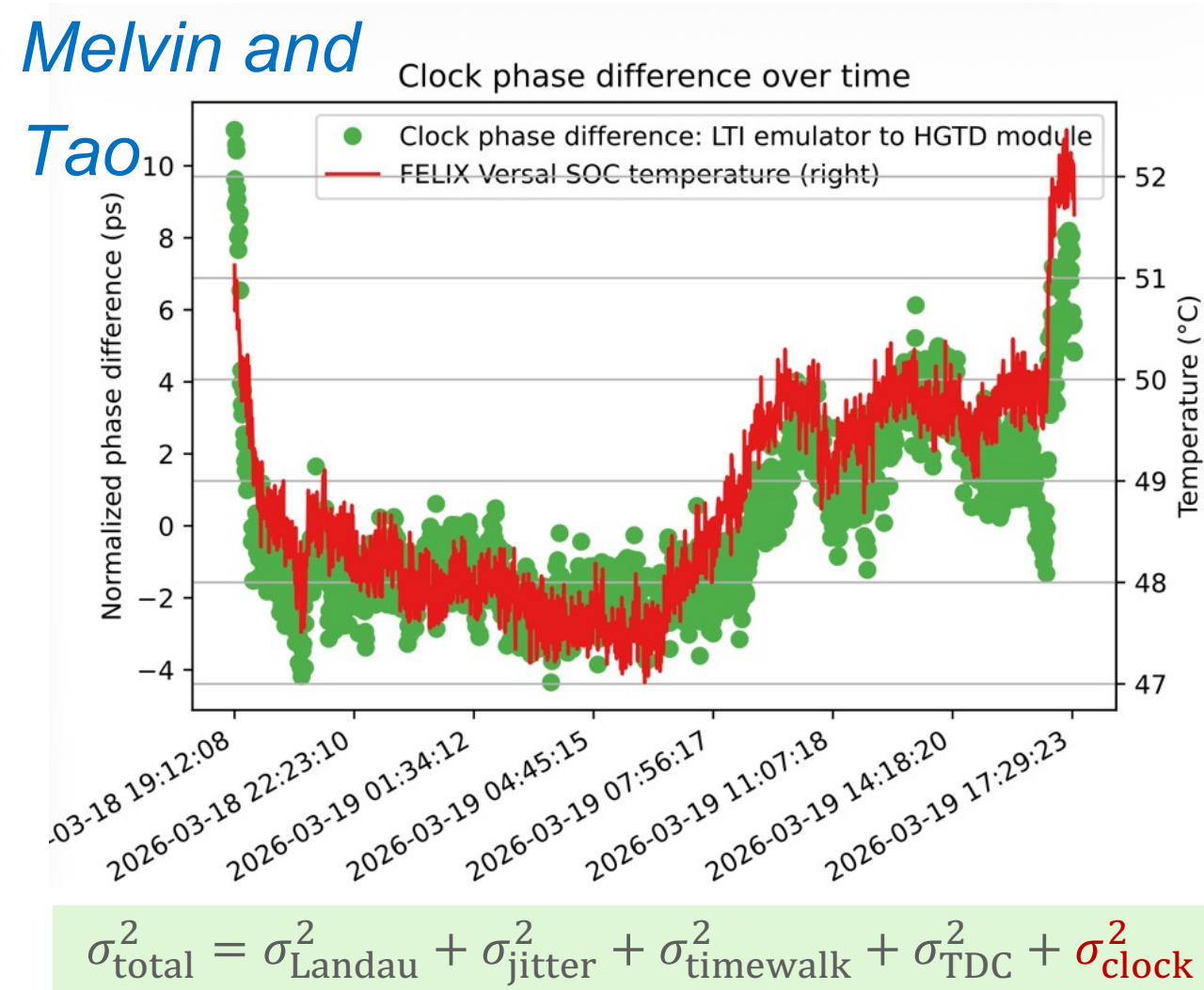
Simulate sensor response

- Compare with testbeam

Characterize clock contributions

- Effect on timing resolution
- Interplay with FELIX

Testbeam with Nikhef PhD students



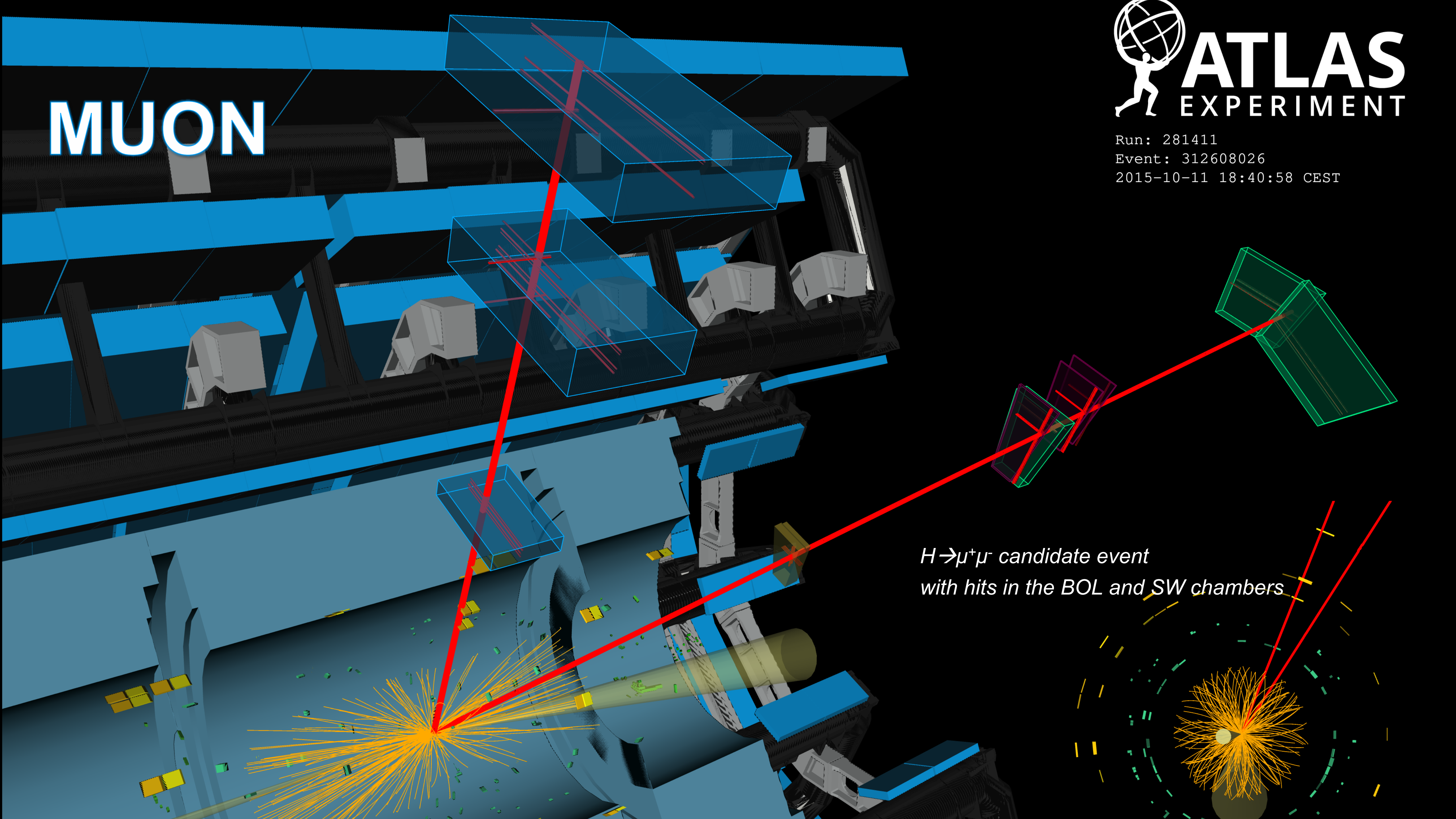
MUON

Run: 281411

Event: 312608026

2015-10-11 18:40:58 CEST

*$H \rightarrow \mu^+ \mu^-$ candidate event
with hits in the BOL and SW chambers*



MUON DETECTOR

Completed BIS production

New barrel BIS chambers

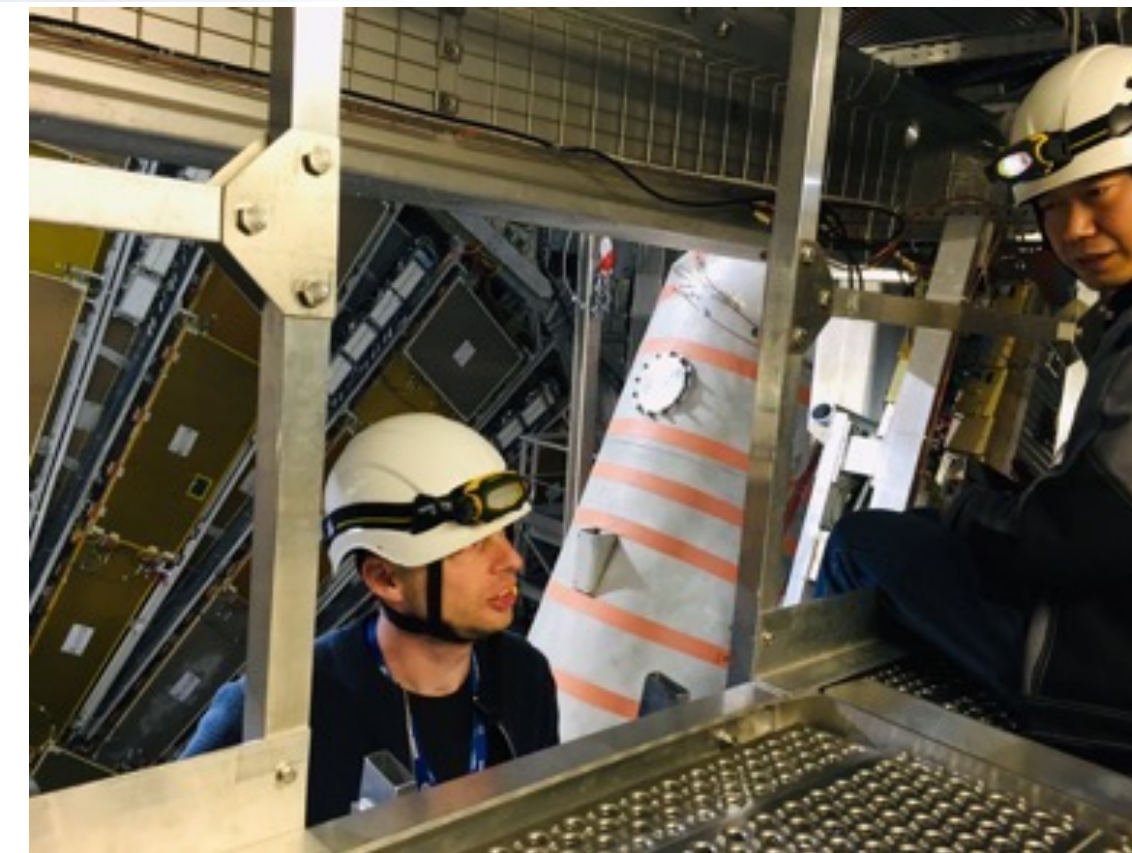
- Granularity + Trigger
 - ~100 chambers to be installed



DCS & Services

- Cabling
- Alignment
- Electronics
 - ~1000 chambers

DCS replacement for LS3

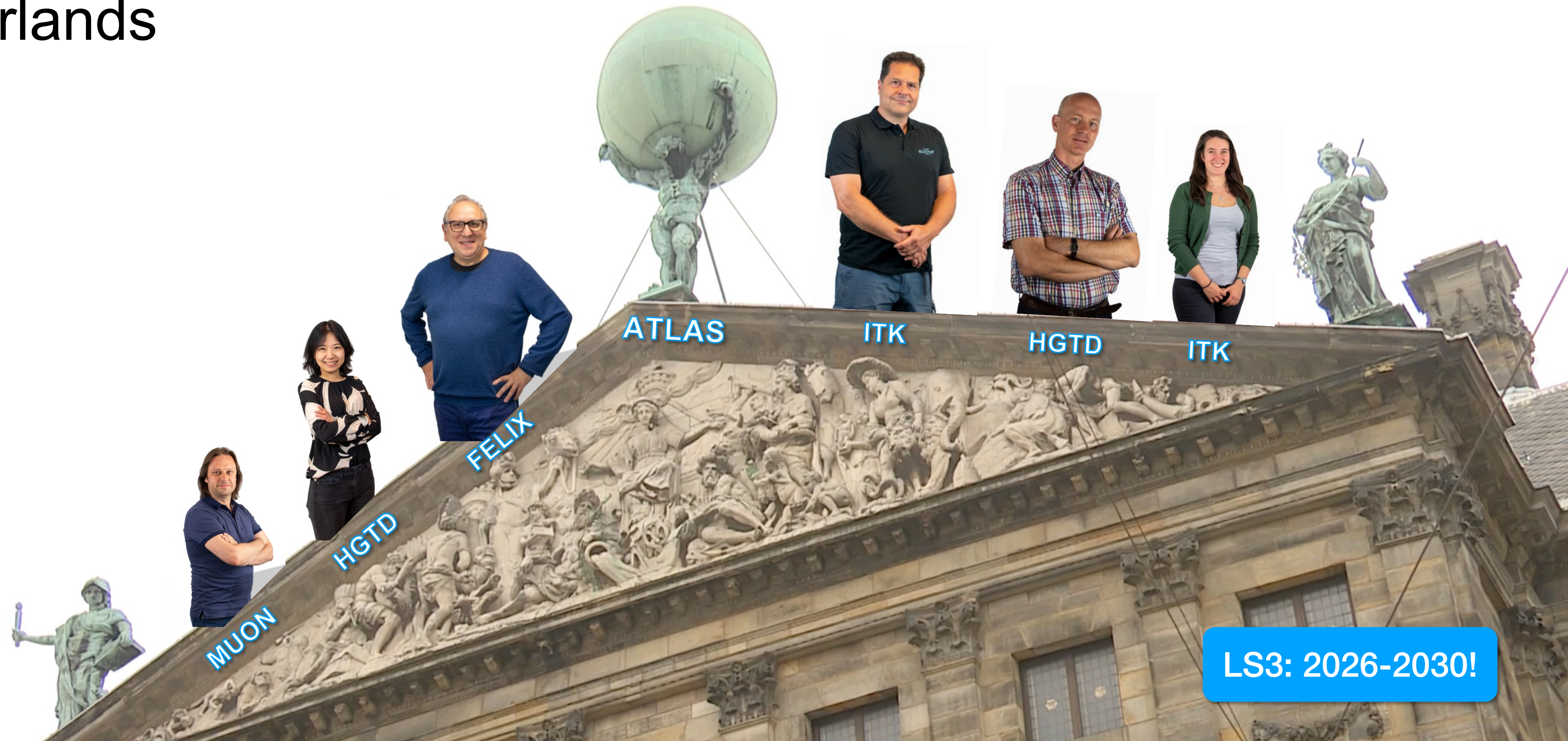


THE ATLAS UPGRADE FOR HL-LHC

Institute-wide effort
from technicians,
engineers, students,
postdocs, and staff

Major ATLAS activity at CERN
and in the Netherlands

- MUON
- HGTD
- FELIX
- ITK



LS3: 2026-2030!

THE FUTURE OF ATLAS AT HL-LHC IS BRIGHT

