ATLAS ITk Pixel Outer Endcap: Assembly and commissiong at LNF

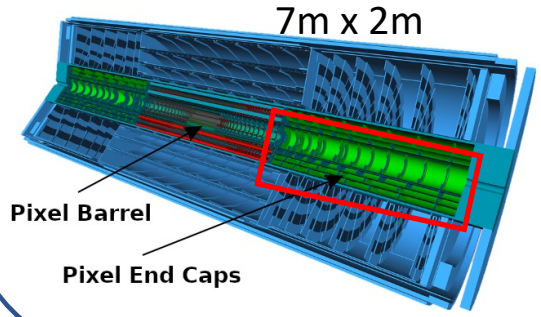
HL-LHC:

- Inst. Lum. up to 7.5 10^{34} cm^{-2} s^{-1} (x 7.5)
- Pile-up up to 200 (x 3)
- Integrated Luminosity 4000 fb^{-1} (x 10)

- High trigger rate: 1 MHz
- High granularity: occupancy at 1 %
- *Radiation hard technologies*

All-silicon tracker with improved tracking:

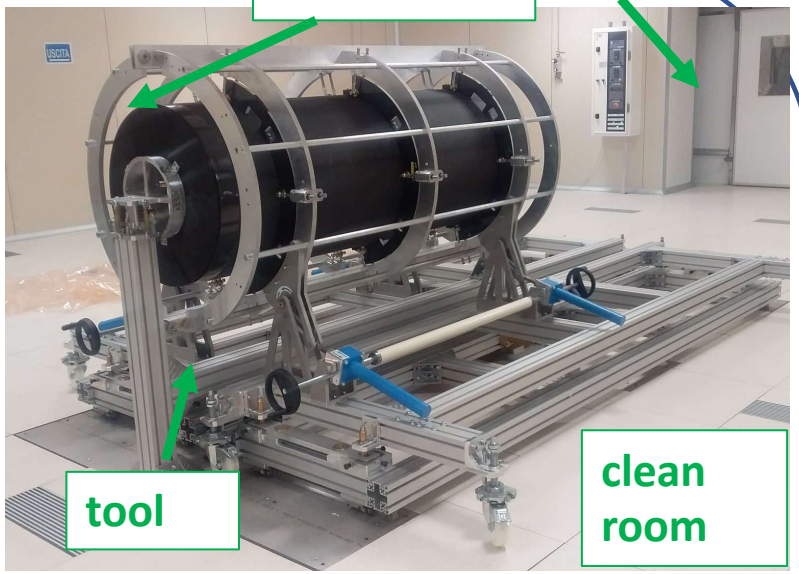
- Coverage up to |η|<4
- Finer segmentation: 50x50µm^2 or 25x100µm^2
- Reduced material: Carbon Fibre, serial powering
- Radiation hardness

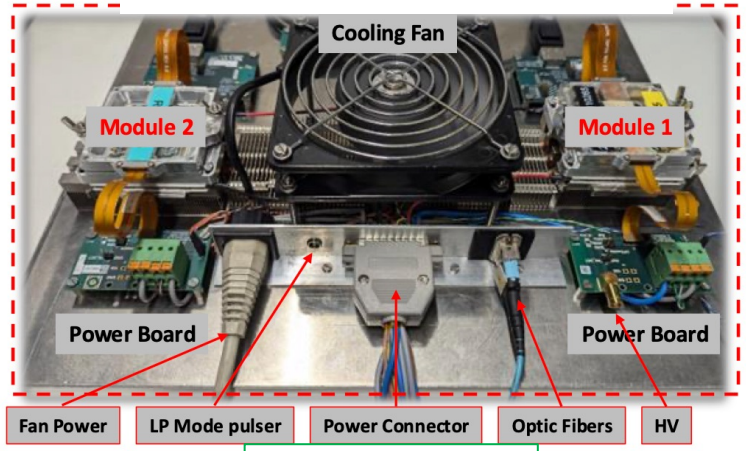


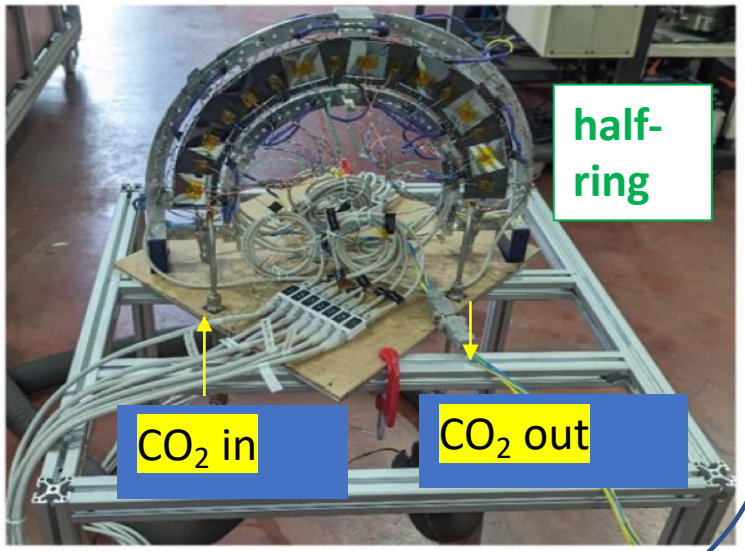
LNF: one outer pixel endcap
1172 Si-modules
8912 data links
7 x 10^8 channels

LNF activities:

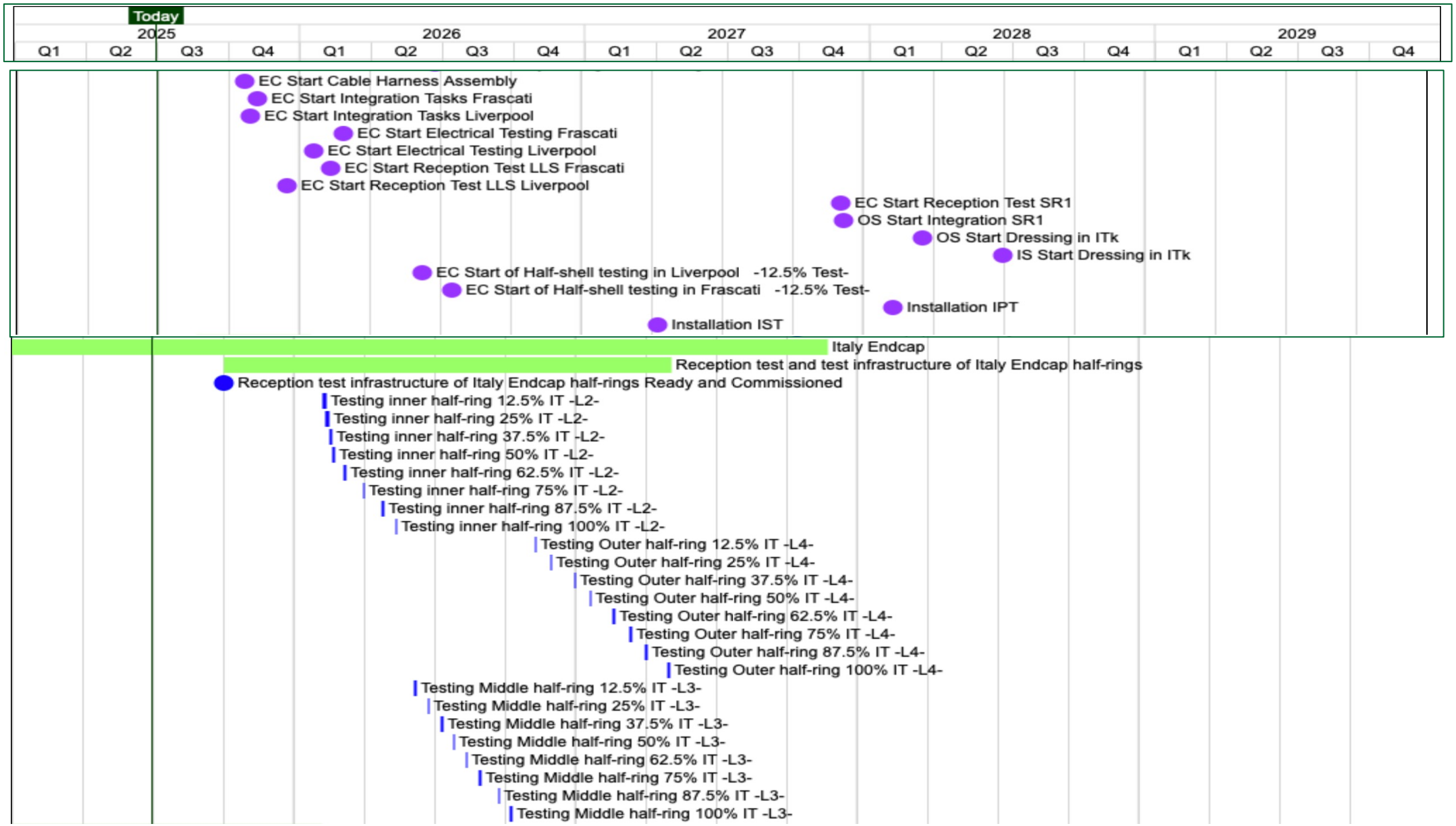
- DAQ and data transmission tests with modules + services
- CO_2 Cooling tests
- Interlock, DCS
- New Large **Infrastructures**
  - Clean room, climate chamber, CO_2 plant
- Design and construction of mechanical tooling
- Thermal cycles







Schedule


Today
2025
2026
2027
2028
2029
Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
EC Start Cable Harness Assembly
EC Start Integration Tasks Frascati
EC Start Integration Tasks Liverpool
EC Start Electrical Testing Frascati
EC Start Electrical Testing Liverpool
EC Start Reception Test LLS Frascati
EC Start Reception Test LLS Liverpool
EC Start Reception Test SR1
OS Start Integration SR1
OS Start Dressing in ITk
IS Start Dressing in ITk
EC Start of Half-shell testing in Liverpool -12.5% Test-
EC Start of Half-shell testing in Frascati -12.5% Test-
Installation IPT
Installation IST
Italy Endcap
Reception test and test infrastructure of Italy Endcap half-rings
Reception test infrastructure of Italy Endcap half-rings Ready and Commissioned
Testing inner half-ring 12.5% IT -L2-
Testing inner half-ring 25% IT -L2-
Testing inner half-ring 37.5% IT -L2-
Testing inner half-ring 50% IT -L2-
Testing inner half-ring 62.5% IT -L2-
Testing inner half-ring 75% IT -L2-
Testing inner half-ring 87.5% IT -L2-
Testing inner half-ring 100% IT -L2-
Testing Outer half-ring 12.5% IT -L4-
Testing Outer half-ring 25% IT -L4-
Testing Outer half-ring 37.5% IT -L4-
Testing Outer half-ring 50% IT -L4-
Testing Outer half-ring 62.5% IT -L4-
Testing Outer half-ring 75% IT -L4-
Testing Outer half-ring 87.5% IT -L4-
Testing Outer half-ring 100% IT -L4-
Testing Middle half-ring 12.5% IT -L3-
Testing Middle half-ring 25% IT -L3-
Testing Middle half-ring 37.5% IT -L3-
Testing Middle half-ring 50% IT -L3-
Testing Middle half-ring 62.5% IT -L3-
Testing Middle half-ring 75% IT -L3-
Testing Middle half-ring 87.5% IT -L3-
Testing Middle half-ring 100% IT -L3-

On going activies and priorities - testing

- DAQ
  - testing with two v1 modules in serial power and 1 v2 module at warm on cold temperatures

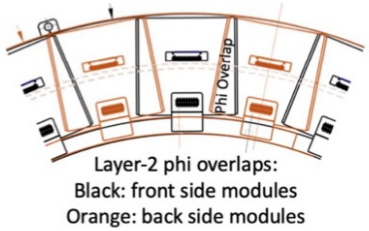
- Readiness of HR reception Q4 2024
  - Testing box assembly - high priority
  - CO2 lines connections to HR and commissioning – high priority
  - DCS for box – high priority

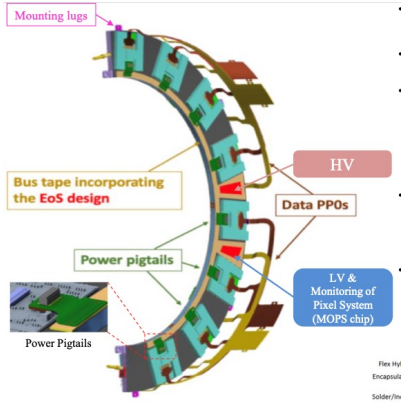
- Thermal Cycle
  - EC waiting for results for Tooling PRR in September
    - Visual inspection and check of lugs – high priority
    - Connect strain gages and LVDT – high priority
    - Interferometer – medium priority

Backup

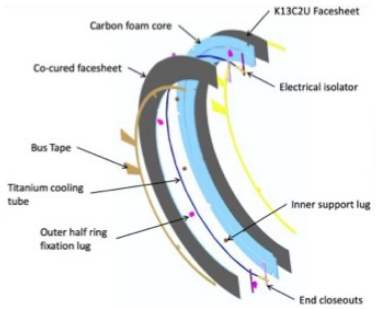
ITk Pixel Outer Endcap

- Three layers of half-rings (HR) loaded into carbon fibre half-cylinde
- HR are strategically placed in z to provide hermeticity in η
- Modules on both sides of HR ⊥ to beampipe → Φ hermeticity
  - >= 5 pixels overlap in ϕ.
- Each HR side holds one **serial-powering** chain:
  - 16/22/26 Modules for Layer2/3/4

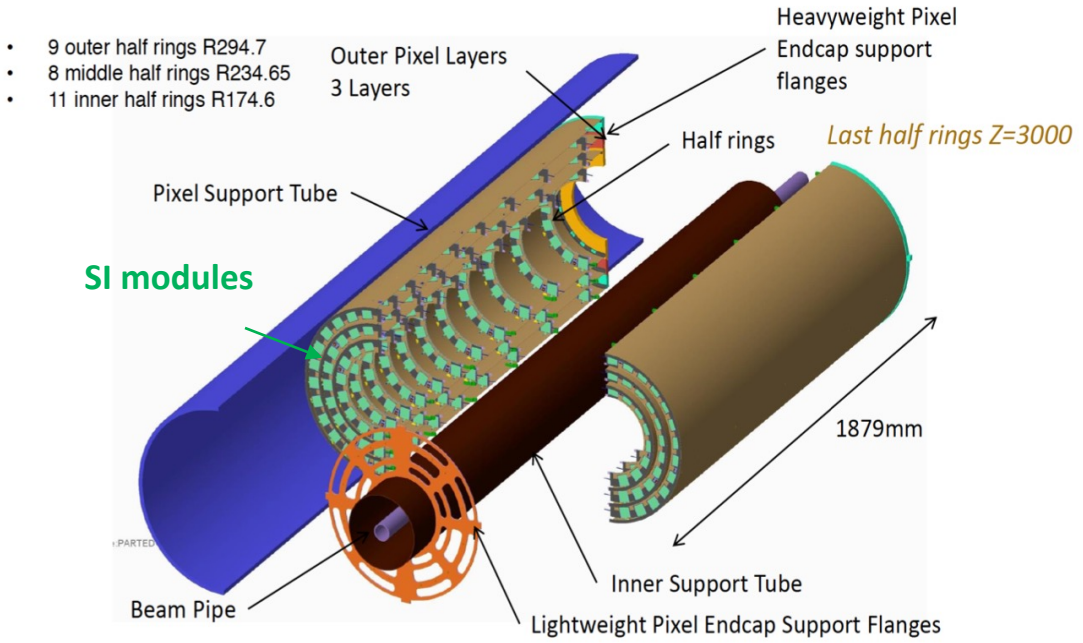




- Half-rings are C-foam / C-fibre “sandwiches” with embedded cooling pipe and fixation lugs



- 9 outer half rings R294.7
- 8 middle half rings R234.65
- 11 inner half rings R174.6



Cooling lines, data and electrical cables, run between outer rims of rings and inner surface of cylinder

IP