

# ATLAS ITk strip test beam campaign at CERN SPS H6 line in 2022

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# ATLAS ITk strip test beam at CERN SPS H6 line

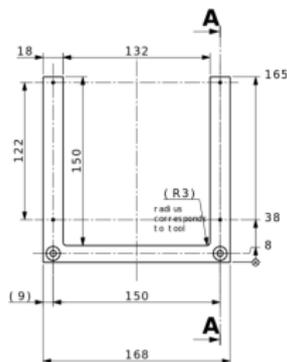
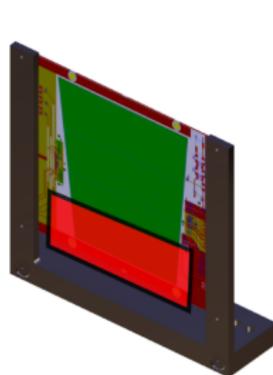
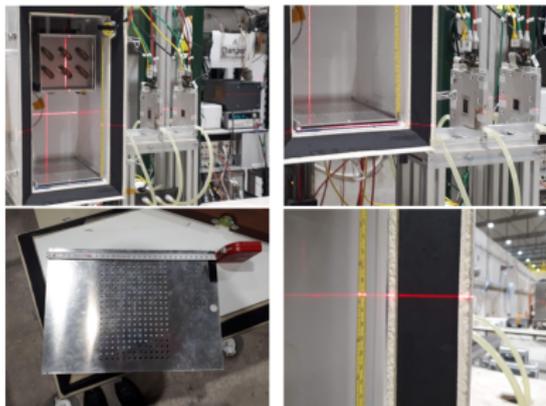
- **Main priority:** testing of Short-Strip (SS) barrel and R0 endcap modules built from production components
  - both modules will be proton irradiated at CERN IRRAD facility to the total fluence of  $1.1 \times 10^{15} \text{ n}_{\text{eq}}/\text{cm}^2$  (expected end-of-lifetime fluence +1.5 safety factor for SS)
  - application for proton irradiation at CERN IRRAD facility, including the active readout of both modules, was submitted with possible beginning in May 2022 (sufficient deactivation of modules needed)
- **Backup plan:** R1 endcap module built from neutron irradiated sensor and X-ray irradiated readout electronics
  - all module components in production version
  - total delivered fluence and TID correspond to HL-LHC end-of-lifetime values incl. 1.5 safety factor
- Results of this test beam campaign are required for the Production Readiness Review of the ATLAS ITk strip modules, which is scheduled in August 2022 - passed PRR basically opens the production phase of the project

# ATLAS ITk strips - beam parameters and equipment

- The H6 ACONITE beam line **booked** for us between July 6 and 13, 2022
- Ideal beam characteristics
  - Particle type and momenta: 120 GeV pions/charged-hadrons (to maximize intensity of pions and avoid scattering on the MPI cooling box)
  - Polarity: no polarity dependent
  - Beam spot size ideally 10 mm × 10 mm
  - Beam intensity: standard  $10^4$  particles per beam spill should be fine (we will discuss with our DAQ experts on the limits of the current module readout chain)
- Necessary beam equipment
  - EUDET Telescope with 6 cooled Mimosa planes
  - Trigger Logic Unit (need to know the type of TLU available at H6 line)
  - 1 pixel timing plane (we have typically used FE-I4 pixel plane with USBPix readout - **is this still available for H6 line?**)
  - XY moving stages (standard PI stages are sufficient if the total load is still fine with the MPI cooling box)
  - MPI cooling box + powerful chiller with liquid coolant, which is able to reach like  $-50^{\circ}\text{C}$  air temperature inside the cooling box
  - inlet tube with gaseous nitrogen to reduce RH in the box (**connection type?**)

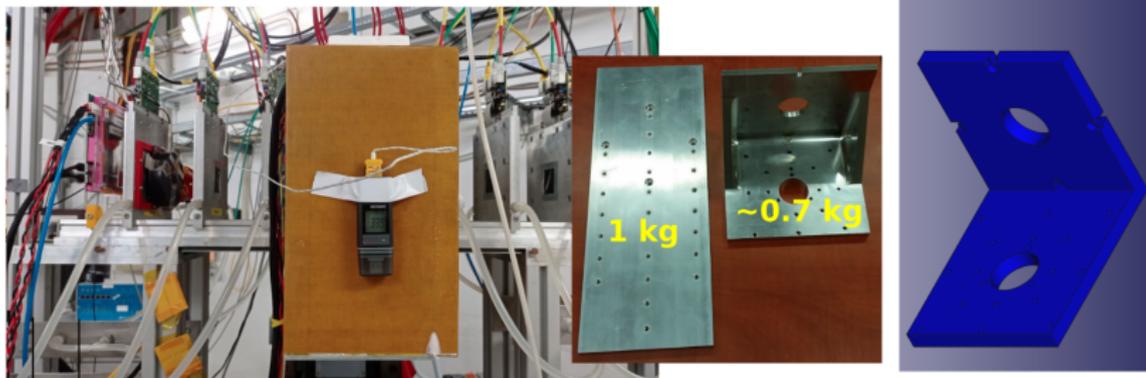
# ATLAS ITk strips - MPI cold box

- If MPI cold box will be used, we need to prepare the module holder to be able to install our module into the box
- We have designed and manufactured the holder for our campaign in 2018 based on information from Andre - would like to prepare equivalent holder for new DUTs - **are these parameters still the same?**
  - total usable height: 280 mm
  - scannable height minimum (moving box up):  $< 0$  mm
  - scannable height maximum (moving box down): 175 mm



# ATLAS ITk strips - polysterene cold box

- In case the MPI box would not be available, we are in principle able to use our polysterene cold box, designed mainly for DESY testbeams (lower beam energy)
  - inner space of the box is cooled down by dry ice - **is there a dry ice available at CERN or somewhere close to the CERN** - typically we consume between 80 and 100 kg of dry ice per week of test beam
  - to stabilize the polystyrene box a special angle bracket was prepared - **is the Angle bracket of PI stages used at H6 line equivalent to the DESY one?**



# ATLAS ITk strips - PS, cables, PC, ...

- The equipment necessary to operate ITk strip module that we bring with us
  - TTi LV power supplies (up to 8 pcs)
  - K2410 HV power supplies (up to 2 pcs)
  - Module readout board and all components of the readout chain
  - All necessary power and data cables - **it would be useful to know type of TLU - HDMI or RJ45 connectors**
  - 1 PC with EUDAQ2 + PC screens
  - Polystyrene cold box with cooling cylinders + dry ice storage boxes
  - FESTO pipes and connections/reductions for distribution of gaseous nitrogen
  - ...

