



SND@LHC is a compact experiment installed at CERN on the ideal prolongation of the LHC beam line, aimed at probing neutrinos of all flavours produced in pp interaction at the ATLAS interaction point.

Goals:

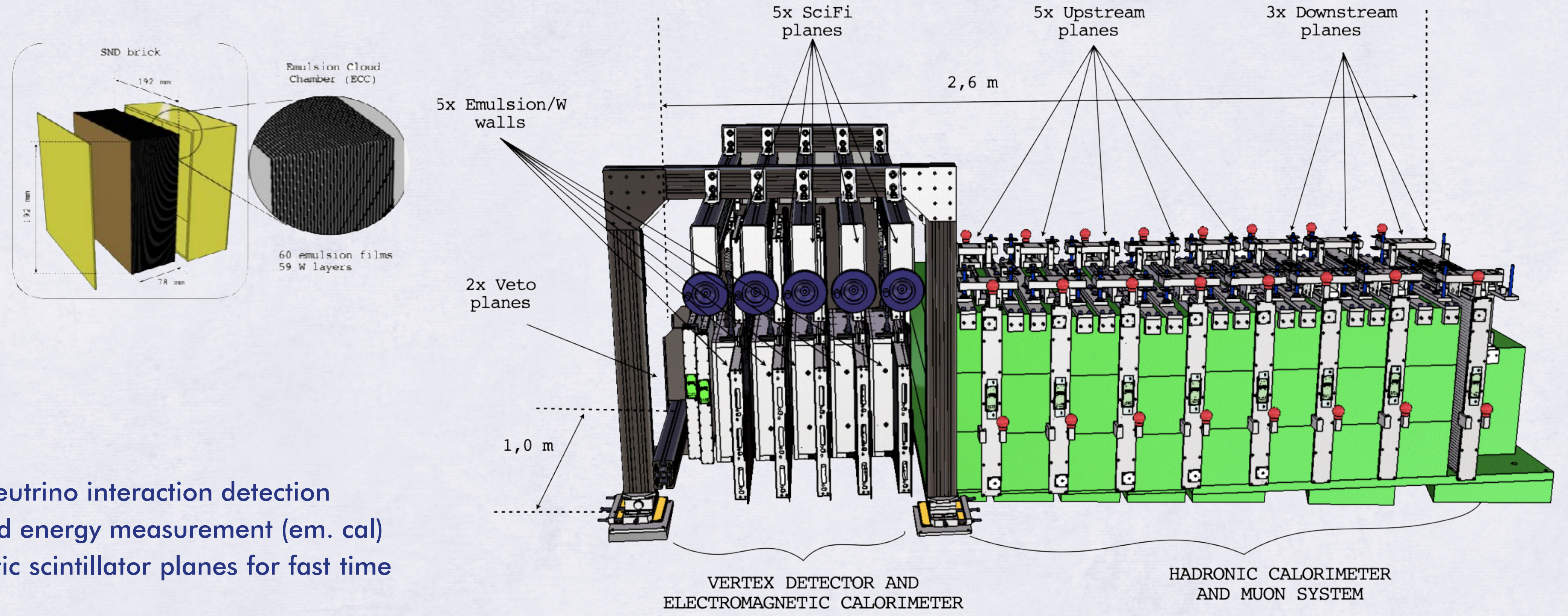
- Charmed-Hadron production in pp collisions
- Lepton flavour universality test
- Feebly interacting particles

Location:

- Tunnel TI18, 480 m from the ATLAS IP
- Slightly off-axis to probe neutrinos produced mostly in charm decays.
- Pseudorapidity range $7.2 < \eta < 8.6$ normalized to 250 fb^{-1} .

Design:

- **VETO PLANES:** tag penetrating muons
- **TARGET REGION** (830Kg):
 - Emulsion cloud chamber ECC (emulsion+tungsten) for neutrino interaction detection
 - Scintillating fiber tracker (SciFi) for timing information and energy measurement (em. cal)
- **HCAL & MUON SYSTEM:** iron walls interleaved with plastic scintillator planes for fast time resolution and energy measurement (hadr. cal)



DETECTOR INSIGHTS

NUCLEAR EMULSION TARGET

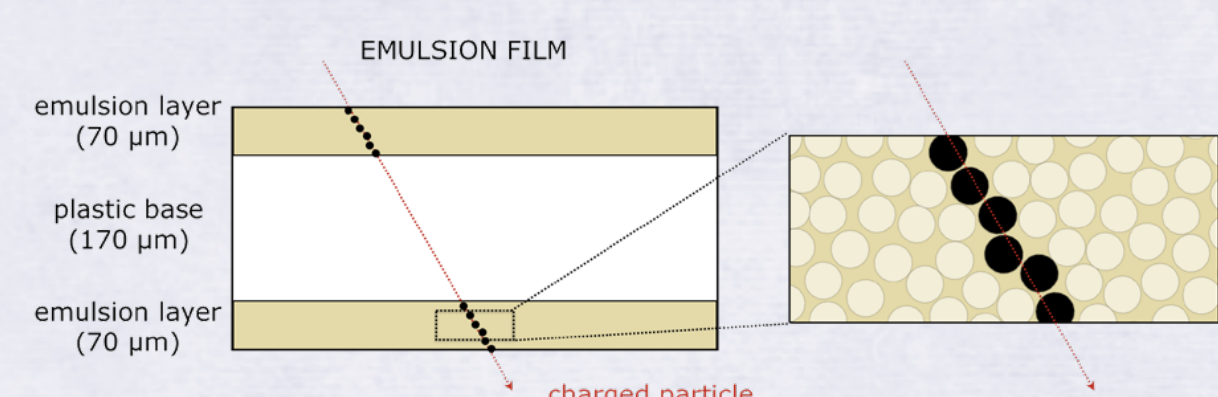


Target wall during the assembly with tungsten plates and emulsion films.

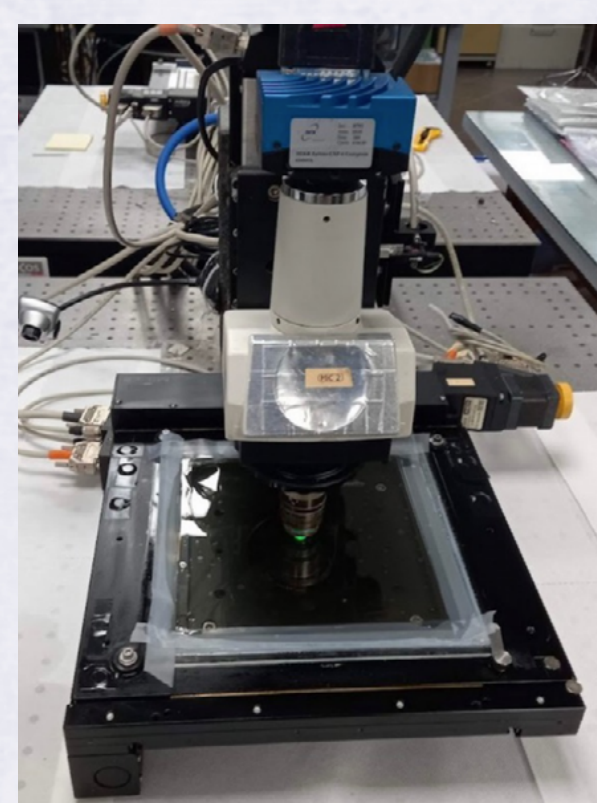
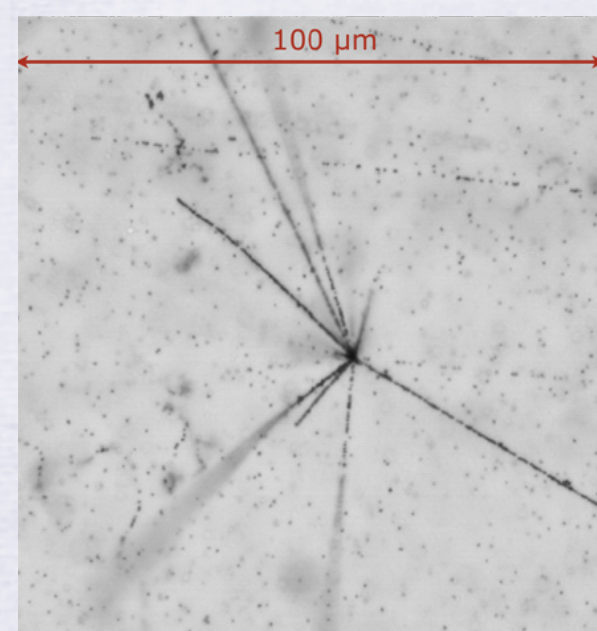
5 walls each consisting of 4 tungsten bricks instrumented using the Emulsion Cloud Chamber (ECC) technology

ECC brick:

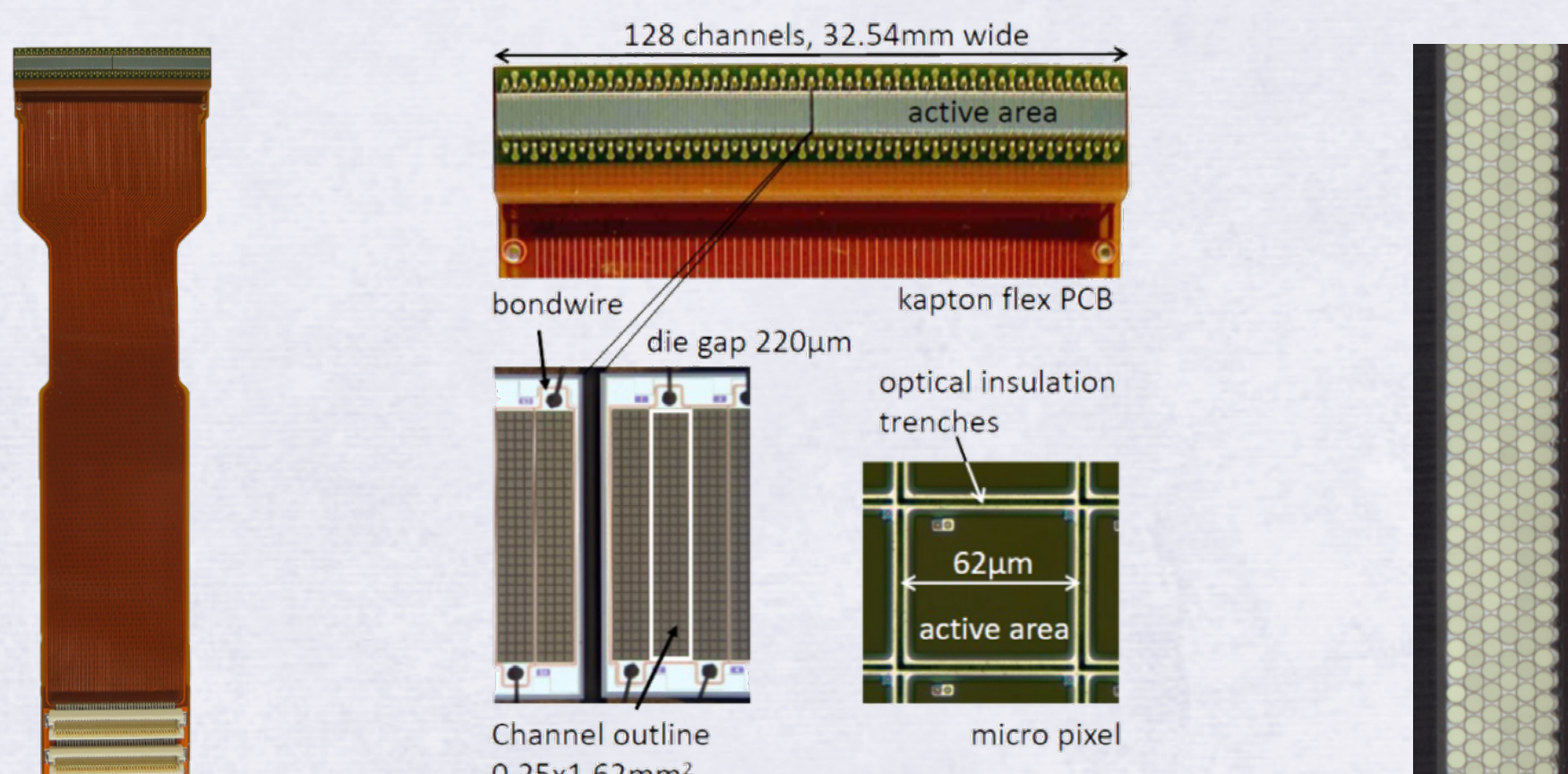
Passive material for neutrino interactions
Nuclear emulsions used as tracking devices to identify neutrino interactions



- 3D tracking detectors made of AgBr;
- Resolution of the order of $1 \mu\text{m}$ or less in position and of 3 mrad in angle;
- After development silver clusters are visible to optical microscope.
- Emulsions scanning performed by means of a fully automated optical microscope;
- 3D Sequences of aligned clusters (grains) are recognized and used to reconstruct Tracks.



TARGET TRACKERS SYSTEM



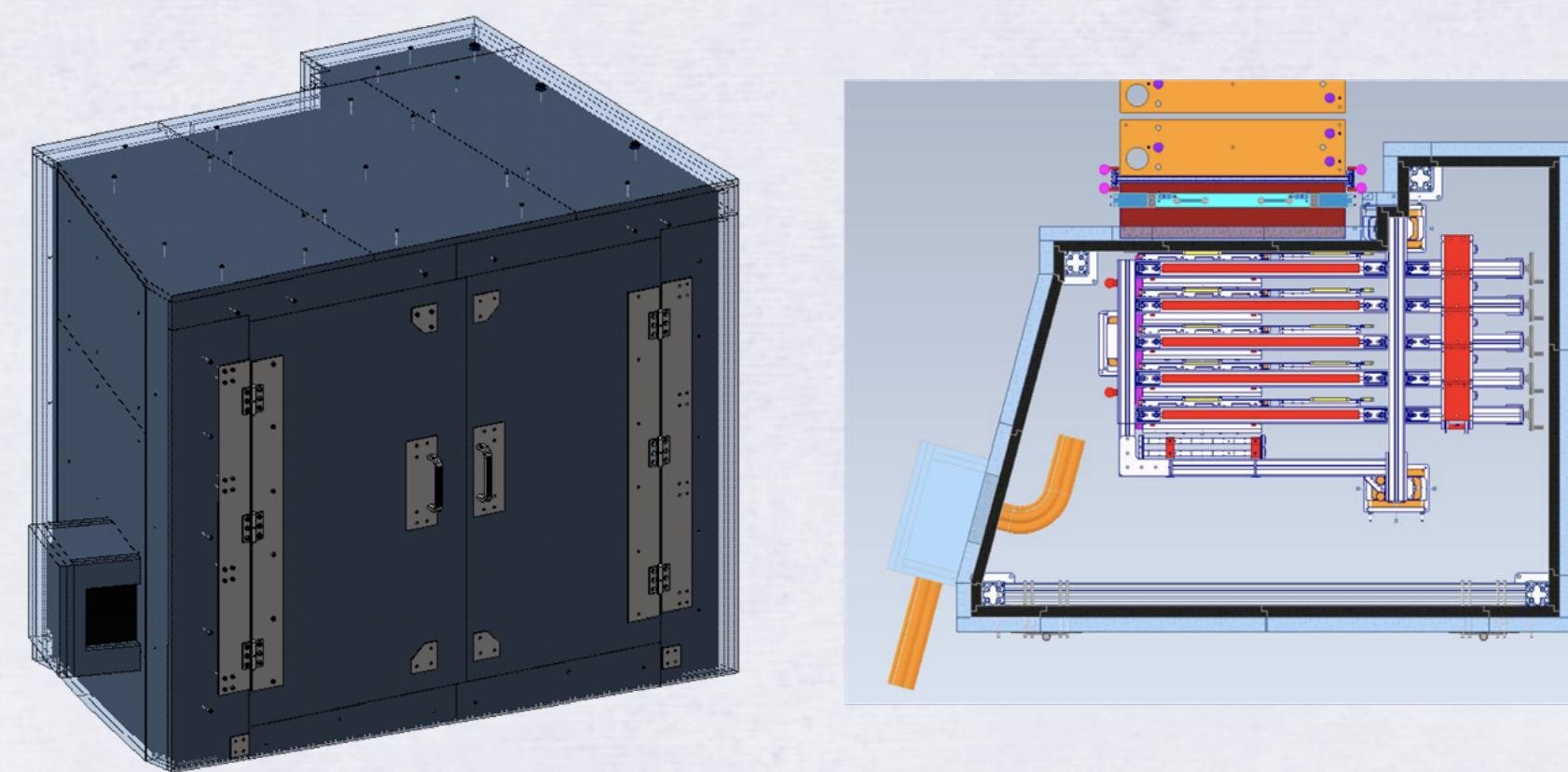
SiPM arrays used for the light detection in the SciFi, mounted on the flex and fiber mat.

5 SciFi planes, each placed downstream to an emulsion wall forming a sampling calorimeter

SciFi module:

double cladded polystyrene fibers, arranged in a mat
SiPMs array is in direct contact with one side of the mat

COOLING & NEUTRON SHIELD



For the long-term stability of emulsion films, the temperature of the target is kept at 15°C and the relative humidity in the range 50 to 55%. For this purpose an insulated box was built around the target region and a cooling system was installed.

VETO, HCAL & MUON SYSTEM

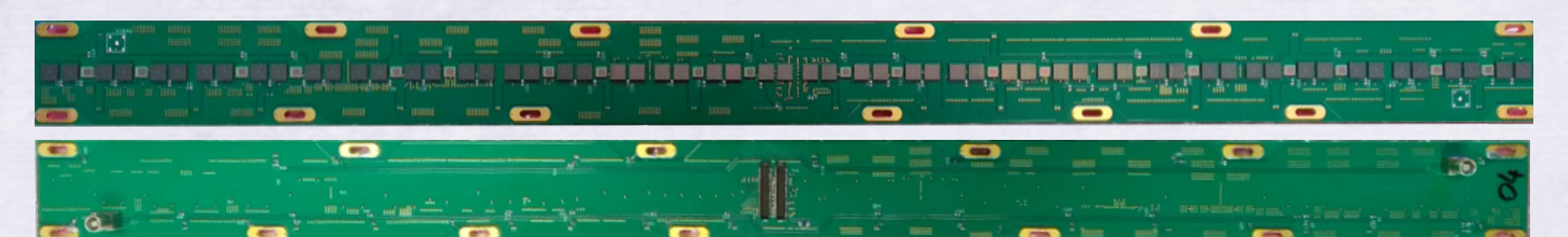


View from above of the veto system in the target region.

- Veto: 2 planes of scintillating bars read out both ends
- HCal and Muon system are composed of two subsystems:
 - Upstream: 5 planes of scintillating bars read out both ends
 - Downstream: 3 stations, first two of two planes of thin scintillating bars. One horizontal plane read out on both sides, one vertical plane read out on one side. Third station with an additional vertical plane.



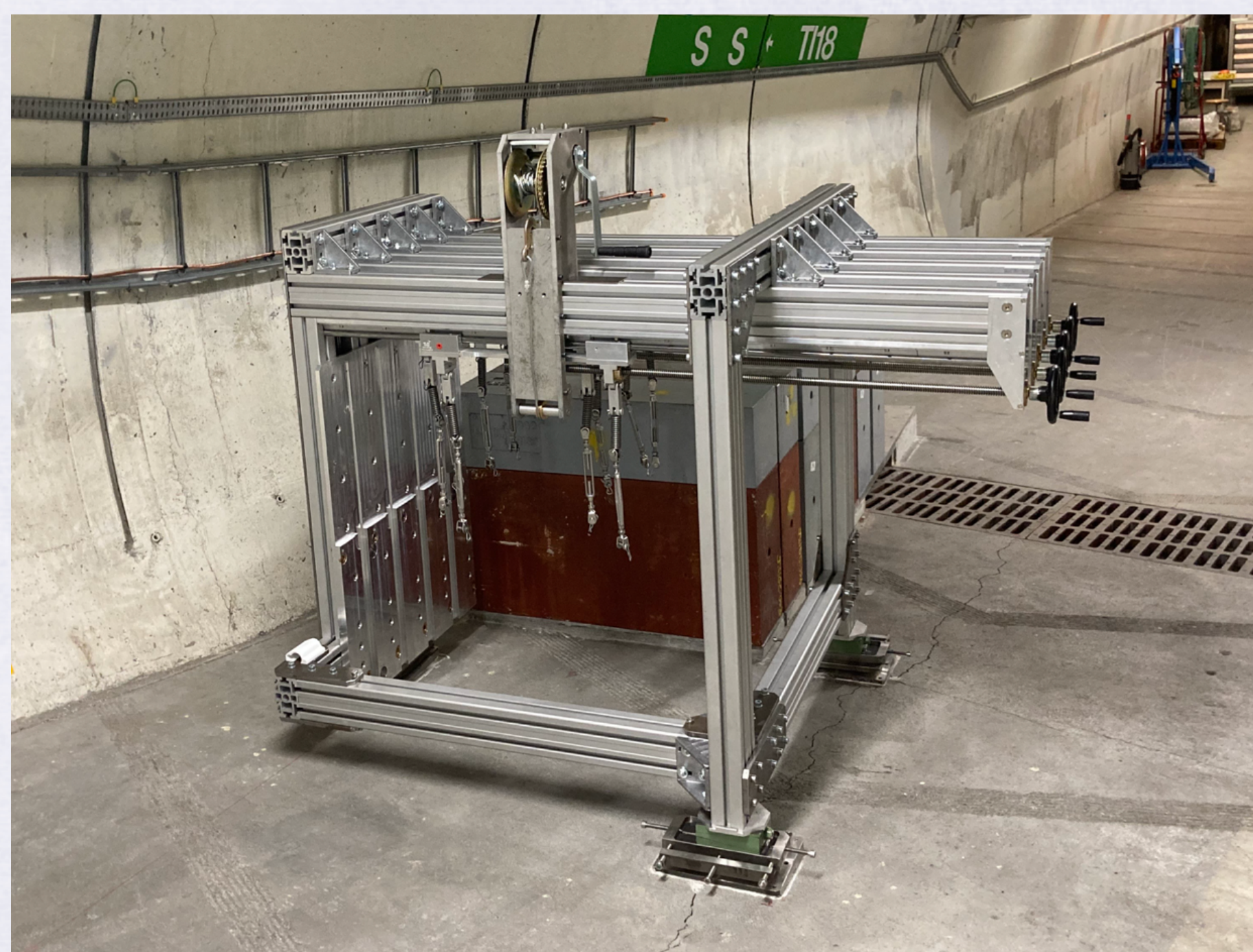
Placement and alignment of an US PCB.



The two sides of the PCB for the US muon system.

DETECTOR INSTALLATION

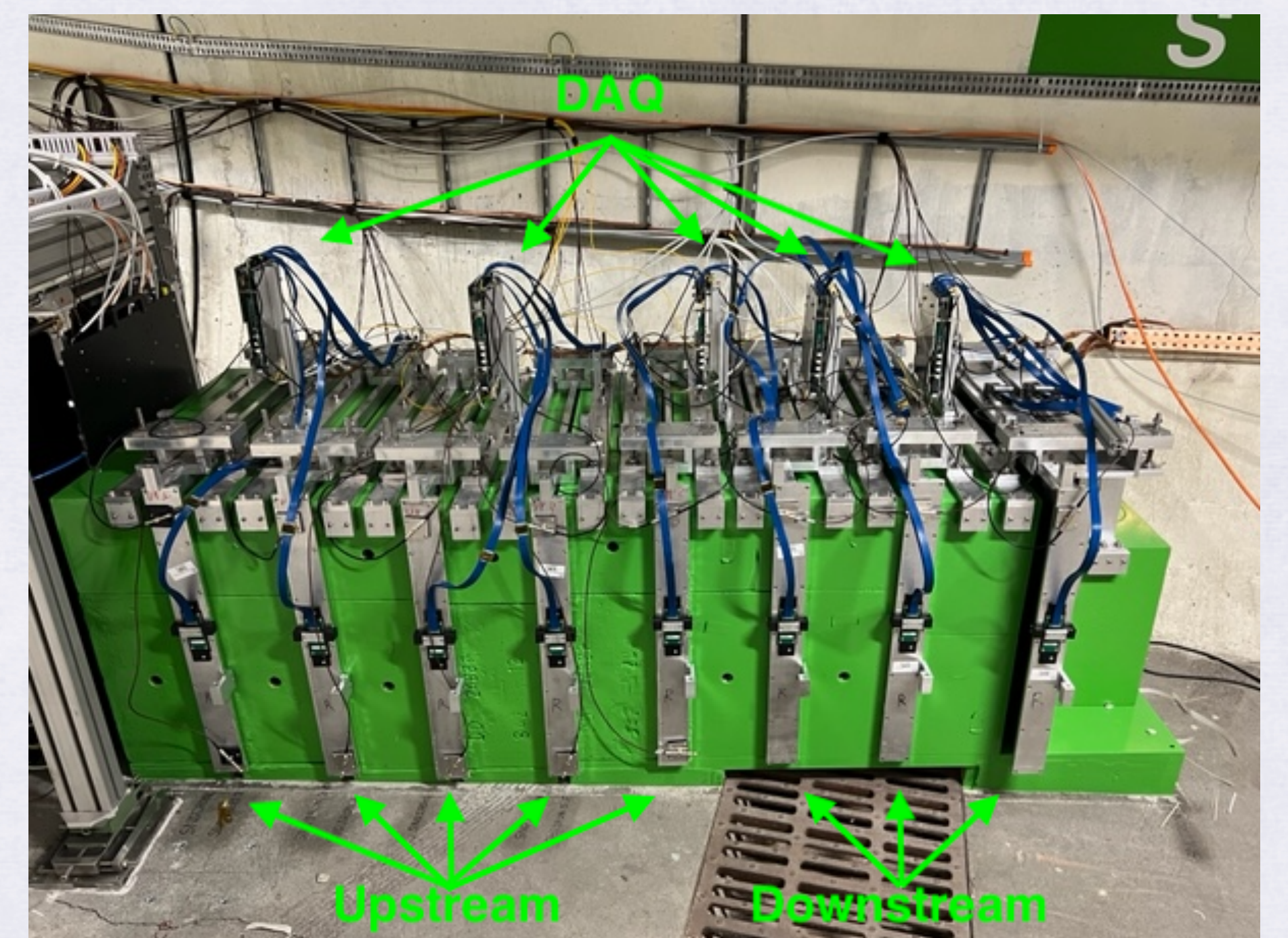
A Test Beam was performed in H8 at CERN in October 2021. The detector is now fully installed in TI18 and taking data.



Mechanical support of the target system after the installation.



Mechanical support of the target system fully loaded with wall boxes and SciFi planes.



Hadronic Calorimeter and Muon system after the installation.