

# ATLAS ITk Pixel Outer Endcap CO<sub>2</sub> cooling system prototype

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In preparation for the high-luminosity LHC phase, the ATLAS detector will be upgraded with a new silicon inner tracker, the ITk, relying on a cooling system based on carbon dioxide (CO<sub>2</sub>) evaporative properties.

In order to test the key aspect of the cooling, prototypes of the cooling system for the different ITk Outer Endcap layers were built in Milan and tested at the CERN CO<sub>2</sub> BabyDEMO cooling plant. The facility is able to provide a CO<sub>2</sub> flow of 150 g/s with a temperature as low as -45 C.

The presentation will illustrate the mechanical construction of the prototype and the use of 3D-printed titanium parts. The thermal load of the detector (up to 1kW on the Layer 4 Half-Shell during normal operation) was also simulated. The sizing of the capillary present in the system, required to reach the design pressure drop 8 bar and to trigger the CO<sub>2</sub> evaporation, will also be discussed. The pressure and temperature sensors installed in the prototype and the data acquisition will be described.

The measurement performed at the BabyDEMO cooling plant, both at the nominal ATLAS operating condition and in more extreme scenarios, will be described. The systems were proved to be stable under all the conditions tested, and the total pressure drops were consistent with the requirements of the system specification.

## Collaboration

ATLAS ITk

## Role of Submitter

I am the presenter

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