



ID contributo: 80

Tipo: **contributed paper**

## The Atlas IBL CO<sub>2</sub> Cooling System

The Atlas Pixel detector has been equipped with an extra B-layer in the space obtained by a reduced beam pipe. This new pixel detector called the ATLAS Insertable B-Layer (IBL) is installed in 2014 and is operational in the current ATLAS data taking. The IBL detector is cooled with evaporative CO<sub>2</sub> and is the first of its kind in ATLAS. The ATLAS IBL CO<sub>2</sub> cooling system is designed for lower temperature operation ( $<-35^{\circ}\text{C}$ ) than the previous developed CO<sub>2</sub> cooling systems in High Energy Physics experiments. The cold temperatures are required to protect the pixel sensors for the high expected radiation dose up to  $550 \text{ fb}^{-1}$  integrated luminosity.

This paper describes the design, development, construction and commissioning of the IBL CO<sub>2</sub> cooling system. It describes the challenges overcome and the important lessons learned for the development of future systems which are now under design for the Phase-II upgrade detectors.

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