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Progress in new environmental friendly low temperature detector cooling systems development for the ATLAS and CMS experiments.

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In the frame of the progress towards the High Luminosity Program of the Large Hadron Collider at CERN, the ATLAS and CMS experiments are boosting the preparation of their new environmental friendly low temperature detector cooling systems. This paper will present a general overview of the progress in development and construction of the future CO₂ cooling systems for silicon detectors at ATLAS and CMS (trackers, calorimeters and timing layers), due for implementation during the 3rd Long Shut Down of LHC (LS3). We will describe the selected technology for the primary chillers, based on an innovative transcritical cycle of R744 (CO₂) as refrigerant, and the oil-free secondary “on detector” CO₂ pumped loop, based on the evolution of the successful 2PACL concept. Different detector layers will profit from an homogenized infrastructure and will share multi-level redundancy that we will describe in details. The technical progresses achieved by the EP-DT group at CERN over the last years will be discussed in view of the challenges and key solutions developed to cope with the unprecedented scale of the systems. We will finally present how mechanics- and controls-related problems have been addressed via a vigorous prototyping programme, aiming at cost- and resource-effective construction of the final systems, which is starting now.

Collaboration

Primary author: ZWALINSKI, Lukasz (CERN)

Co-authors: VERLAAT, Bart (CERN); Mr DAGUIN, Jerome (CERN); Mr PETAGNA, Paolo (CERN); Ms GIAKOUMI, Dina (CERN); Mr BHANOT, Viren (CERN); Mr PAKULSKI, Tym (CERN); Mr DAVOINE, Loic (CERN); Mr SLIWA, Krzysztof (CERN); Mr HULEK, Wojciech (CERN); Mr JOAO, Noite (CERN); Mr BARROCA, Pierre (NTNU); Mr DOUBEK, Martin (CERN); Mr HANF, Pierre (CERN); BORTOLIN, Claudio (INFN-PD)

Presenter: ZWALINSKI, Lukasz (CERN)

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