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CO₂ evaporative cooling: the future for tracking detector thermal management

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In the last few years, CO₂ evaporative cooling has been one of the favourite technologies chosen for the thermal management of tracking detectors at LHC. ATLAS Insertable B-Layer and CMS Phase I Pixel have adopted it and their systems are now operational or under commissioning. The CERN PH-DT team is now merging the lessons learnt on these two systems in order to prepare the design and construction of the cooling systems for the new Upstream Tracker and the Velo upgrade in LHCb, due by 2018. Meanwhile, the preliminary design of the ATLAS and CMS full tracker upgrades is started, and both concepts heavily rely on CO₂ evaporative cooling. This paper highlights the performances of the systems now in operation and the challenges to overcome in order to scale them up to the requirements of the future generations of trackers. In particular, it focuses on the conceptual design of a new cooling system suited for the large phase2 upgrade programmes, which will be validated with the construction of a common prototype in the next years.

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