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Performance tests of dual-phase CO_2 cooling for particle detectors

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Evaporative CO_2 cooling is a promising solution for the cooling of high-energy particle detectors, such as the new ATLAS Inner Tracker (ITk) for the high-luminosity upgrade of the LHC.
CO_2 offers a high latent heat transfer at reasonable flow parameters and is an environment friendly alternative to many other currently used coolants.
At the same time, the operation in the dual-phase regime comes with several parameters influencing the cooling performance compared to a monophase coolant.
Some of these are experimentally studied using prototypes from the ITk strip detector end-cap. Here, the local support structure called petal core should allow a good heat transfer between the silicon strip modules glued on the surface and the embedded titanium cooling pipe.
Systematic investigations on the thermal performance using infrared thermography are used to study the influence of dual-phase CO_2 cooling parameters, such as heat load or mass flow rate, and are compared to simulation.

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No, this is an entirely new submission.

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