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## The large-scale CO<sub>2</sub> cooling systems for ATLAS and CMS upgrades: design and operational aspects

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The ATLAS and CMS Phase II upgrade program foresees several detectors to be cooled with liquid 2-phase CO<sub>2</sub> in a pumped cycle. The total cooling power in each experiment (about 300 kW in ATLAS and 550 kW in CMS) and the number of different detectors choosing the same technology (up to 4 subdetectors in CMS), calls for the CO<sub>2</sub> cooling system to be designed, constructed and operated with a modular and standardized approach.

This talk highlights the concept of the modular design from the point of view of the component selection and qualification, the plant layout and the detector distribution. As well, the operational aspects related to the parallel operation of several plants, the redundancy schemes and their impact on the detector operation are explained.

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