

Evaporative cooling in ATLAS –present and future

Evaporative cooling is gaining interest in the particle physics community, due to the promise of reduced material, good temperature uniformity, and the wide range of temperatures accessible. The largest such system to-date operates in ATLAS, where it removes the heat from the semiconductor detector systems (Silicon strips and pixels). During the installation and commissioning of this system many lessons had to be learned.

In parallel we have re-evaluated the requirements for the cooling system, in particular for the evaporation temperature, over the full ATLAS operational lifetime, and can compare them to the real system performance. The critical requirement is for thermal stability at the end of the operation in the high-radiation environment. To predict this we have developed a simple thermal model of the detector modules which yields analytical expressions to evaluate the results of changes in the operating conditions. After a comparison of the revised requirements and the actual present cooling system performance we will discuss various modifications to the system which will be required for future operation.

In parallel we are developing a cooling system for the ATLAS phase II upgrade (sLHC) tracker, which again will be evaporative. A set of requirements has been specified, for which we are now developing more detailed system designs. Two technologies, based on different coolants, fluorocarbons or CO₂, are being pursued.

Summary (Additional text describing your work. Can be pasted here or give an URL to a PDF document):

<http://www-pnp.physics.ox.ac.uk/~viehhaus/Evaporative%20cooling%20in%20ATLAS%20-%20further%20material.pdf>

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