



Contribution ID: 1

Type: **not specified**

Welding Development for Thin-Wall Ti Cooling Tubes for the ATLAS Inner Tracker

Thursday 30 May 2024 10:30 (20 minutes)

In preparation for the High-Luminosity LHC era, the ATLAS experiment is upgrading several of its subdetector systems. Among these is the innermost subsystem, the Inner Tracker (ITk), which is being upgraded to an all-silicon tracking detector. The detector will be cooled using a two-phase evaporative CO₂ system. To minimize the mass of the detector and its impact on track reconstruction, thin-wall titanium pipes are to be used for the evaporator pipes and capillaries, with tube diameters ranging from 1.1mm to 3.5mm. In this talk, we discuss the development of novel welds to be used in the Inner System of the ITk, and the designs developed to overcome the challenges of welding small-diameter tubes for an extremely space-constrained detector.

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Session Classification: Talks