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Coupled ring cooling loop design and prototyping for the ATLAS Pixel Inner System

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We present the design and prototyping of the coupled ring cooling loop to be used in the 2 phase CO₂ cooling of the ATLAS Pixel Inner System for ATLAS at the HL-LHC. The ring is fabricated using thin-wall titanium tubing and must be fabricated to exacting tolerances to fit the composite structure on which the pixel sensors and readout chips are mounted. The tooling developed to realize this geometry and the issues encountered during the prototype fabrication are discussed. Welded tube-tube connections are required as part of the design, such as to connect tubes to electrical breaks or to manifolds. We present bench tests of such connections using a commercial orbital welding system.

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