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Assembly and Electrical Tests of the First Full-size Forward Module for the ATLAS ITk Strip Detector

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The ATLAS experiment will replace the existing Inner Detector by an all-silicon detector named the Inner Tracker (ITk) for the High Luminosity LHC upgrades. In the outer region of the Inner Tracker is the strip detector, which consists of a four layer barrel and six discs to each side of the barrel, with silicon-strip modules as basic units. Each module is composed of a sensor and one or more flex circuits that hold the read-out electronics. In the experiment, the modules are mounted on support structures with integrated power and cooling. The modules are designed with geometries that accommodate the central and forward regions, with rectangular sensors in the barrels and wedge shaped sensors in the end-caps. The strips lengths and pitch sizes vary according to the occupancy of the region.

In this contribution, we present the construction and the results of the electrical tests of the first full-size module of the innermost forward region, named Ring 0 in the ATLAS ITk strip detector nomenclature. This module uses a sensor with stereo annulus geometry, having four segments of strips of different lengths and pitch. The read-out of the strips is achieved through dedicated ASICs mounted on two hybrid boards, with 8 and 9 chips. The two innermost strips segments are read out through 8 chips, for a total of 2048 strips, while the two outermost segments are read out through 9 chips, for a total of 2304 strips. We introduce the assembly procedure that lead to the construction of the module as well as the testing during the intermediate steps.

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