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First experience from the system test setup for the ATLAS ITk strips end-cap detector

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The new ATLAS Inner Tracker (ITk) will replace the current tracking detector of the ATLAS detector to cope with the challenging conditions for the Phase-II upgrade of the Large Hadron Collider experiment (LHC), the so-called High Luminosity LHC (HL-LHC). The new tracking detector is an all-silicon detector consisting of a pixel inner tracker and a silicon microstrips outer tracker, differentiated again in a central barrel section around the interaction point and two end-cap sections covering the forward regions for the collisions.

This contribution focuses on the full system test setup developed for the ITk strips detector system, being the testbed for testing and evaluating the performance of several close-to-final detector components before production. These will also serve in the future for training and testing purposes of the detector during operation. The system test for the strip end-cap sub-system is developed at DESY in Hamburg/Germany loaded with up to 12 petals - mechanical core structures loaded with trapezoidal shaped sensor modules of various strip lengths and pitches including the corresponding readout and power electronics. The local support structures are mechanically held in place within a global support structure, which mimics realistically the end-cap global structure. Similarly, the services in terms of electrical, optical and cooling are as realistic as possible as in the latter detector integration. Due to these design decisions for the system test development, it is possible to validate the detector design, verify the detector DAQ and perform tests with the services, e.g. concerning the dual-phase CO₂ cooling.

This contribution gives an overview of the developed end-cap system test for the ITk strip detector and summarizes the first experience of insertion and operation of petals into the end-cap structure. From these, important lessons for the coming full detector integration at DESY and Nikhef for the end-cap sub-systems can be retrieved.

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