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Development and evaluation of prototypes for the ATLAS ITk pixel detector

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The ATLAS tracking system will be replaced by an all-silicon detector for the HL-LHC upgrade around 2025. The innermost five layers of the detector system will be pixel detector layers which will be most challenging in terms of radiation hardness, data rate and readout speed. A serial power scheme will be used for the pixel layers to reduce the radiation length and power consumption in cables. New elements are required to operate and monitor a serially powered detector including a detector control system, constant current sources and front-end electronics with shunt regulators. Prototypes for all subsystems are built to verify the concept and operate multiple serial power chains as a system test. The evaluation of both the readout of multi-modules and mechanical integration are further aims of the prototyping campaign. In the contribution, results will be presented of this prototyping effort. Moreover, details and features of serial powering for full detector systems will be given.

Presenter: BUAT, Quentin (CERN)

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