Quality control of ATLAS ITk stave alignment during assembly

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The future of the LHC is the High Luminosity upgrade (HL-LHC), a project that will allow precision measurements of rare phenomena with much greater statistics than currently achievable. To maintain successful physics output in the challenging environment presented by the HL-LHC, the ATLAS detector will undergo major upgrades beginning in 2026. The most significant of these upgrades is the new all-silicon Inner Tracker (ITk) detector, which will provide robust tracking performance, an asset particularly in searches for new physics phenomena. BNL is in charge of building half of the barrel strip detector that includes about 200 staves, which are the units that provide mechanical support, cooling, electrical distribution and data connection to strip modules. This project aims at streamlining the calibration of the stave alignment, by facilitating the operator to identify faults in the assembly process. More specifically, an automated checks are performed in python scripts embedded in the LabView program that controls the assembly process. Such checks are performed on the pattern recognition software that is used aligns the stave and on the assessment of the residuals between the actual ad nominal positions of the module during and after mounting.