

The ATLAS Experiment is preparing for the Phase 2 upgrade. Leading the upgrade program is the replacement of the current Inner Detector with an all-silicon Inner Tracker (ITk) designed to operate during High-Luminosity LHC with an average of 200 proton-proton interactions per bunch crossing. The ITk will consist of a Strip detector and a Pixel detector. The five layer Pixel detector will be constructed from three sub-systems. One system occupying the central three outermost layers, called the ITk Pixel Outer Barrel, will use carbon-fiber local supports with steel pipes that provide CO₂ cooling and services for 4472 loaded pixel detector module cells. A loaded module cell combines an ITk pixel hybrid module with four front-end chips and a thermo-mechanical structure called bare cell. The bare cell is made of aluminium graphite block and pyrolytic graphite tile for precise positioning and thermal coupling respectively.

The contribution will share experiences from the pre-production qualification campaign for loaded module cell assembly and quality assurance carried out last year at the University of Geneva. The institute loaded onto bare cells or thoroughly characterized about 34 modules to verify the production procedures, loading accuracy, electrical integrity, and thermal performance at each site. The pre-production campaign demonstrated reliable assembly and testing capabilities in a large-scale production chain, and it identified an insulation issue between the module and the bare cell, allowing corrective actions before large-scale production.

This contribution presents the developed site production equipment, the homogenization process of the equipment, and common production rules at the University of Geneva. The entire cell loading workflow and qualification procedures will be explained, as well as the results, and systematic studies of the pre-production run will be shared. Ultimately, the contribution will show lessons learned to produce components for the best possible tracking detector.