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Upgrade of the ALICE Inner Tracking System

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The Inner Tracking System (ITS) of the ALICE experiment will be upgraded during the second long LHC shutdown in 2019-2020. The main goal of the ALICE ITS Upgrade is to enable high precision measurements of low - momentum particles ($< 1 GeV/c$) by acquiring a large sample of events, benefiting from the increase of the LHC instantaneous luminosity of $Pb - Pb$ collisions to $\mathcal{L} = 6 \cdot 10^{27} cm^{-2} s^{-1}$ during Run 3. Working in this direction the ITS upgrade project is focusing on the increase of the readout rate, on the improvement of the impact parameter resolution, as well as on the improvement of the tracking efficiency and the position resolution. The major setup modification is the substitution of the current ITS with seven layers of silicon pixel detectors. The ALPIDE chip, a CMOS Monolithic Active Pixel (MAP) Sensor, was developed for this purpose and offers a spatial resolution of 5μm. The use of MAP sensors together with a stringent mechanical design allows for the reduction of the material budget down to 0.3 % X_0 for the innermost layers and 1 % X_0 for the outer layers.

During the research and development period a variety of tests were performed on all components for the validation of the detector design. A series of ageing tests were done to validate the assembly procedure and to ensure the proper performance of modules and staves after several years of operation in ALICE. The production phase has started with all the new assembled components undergoing different tests that aim to characterise the modules and staves and determine their qualification level. Measurements with a radioactive source were also done and are indicative of the response of the ALPIDE chips even after being assembled in a larger scale structure. This contribution will focus on the detector design, on the measurements performed during the research and development phase, as well as on the production status and the first results from quality assurance.

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