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First bent wafer-scale sensor in truly-cylindrical geometry for the ALICE ITS3 detector

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A pillar of the ALICE upgrade program is the improvement of the Inner Tracking System (ITS2) performance by the replacement of its three innermost layers during the next/third long shutdown of the LHC (LS3). The proposal is based on a vertex detector consisting of three cylindrical layers composed by curved wafer-scale silicon sensors. The new detector will present a significant reduction of the material budget, thus improving the spatial resolution of the reconstructed charged tracks. Extensive characterization studies of bent single ALPIDE chips (used for the current ITS), have been carried out to evaluate their performance under the mechanical stress involved in the bending process and the results have demonstrated that none of the ALPIDE functionalities are affected by the curvature effect. These tests on small sensors have opened the way to the investigation of a large scale sensor: a full size demonstrator of a half-layer in a truly cylindrical shape is being assembled for the first time, based on so called super-ALPIDE chips. Such activity has required the development of special tools and procedures dedicated to bend and read out the new pixel matrix.

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