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Test of Techniques for the Assembly of Silicon Pixel Detector Modules Needed for the High-Luminosity Upgrade of the CMS Experiment at CERN

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The stages of the assembly process and preliminary testing of four-chip silicon modules (CROCs) designed to detect charged particles in the TFPX region of the Inner tracker at CMS experiment within the framework of CERN High Luminosity updates are detailed. These stages correspond to assembly using an Aerotech gantry, positioning data collection based on the angular opening and the average slide of the chips to select the modules prepared for the wire bonding process, and ends with the performance of two types of tests on these modules, the Shunt and Low Drop output Voltage (SLDO) and pixel alive test.

In addition, it is recognized the importance of implementing this rigorous module assembly process in the future reconstruction of physical phenomena, product of proton-proton collisions, which could explain and deepen the understanding of the behavior of elementary particles within the standard model and even study the physics beyond it.

In the assembly process, it was found that both the average angular opening and the average slide of the HDI with each of the chips did not exceed 25 μm , which makes the assembled modules suitable for performing the wire bonding process.

In the testing process, it was possible to observe the behavior of the chips against the growth of the current induced by the power supply and also the number of functional pixels in the chips. A good correspondence was found between the results and the expected behavior for the chips.

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