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Experience from Construction and Operation of the STAR PXL MAPS Based Vertex Detector

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A new silicon based vertex detector called the Heavy Flavor Tracker (HFT) was installed at the STAR experiment for the RHIC 2014 heavy ion run to improve the vertex resolution and extend the measurement capabilities of STAR in the heavy flavor domain. The HFT consists of 4 concentric cylinders around the STAR interaction point composed of three different silicon detector technologies based on strips, pads and for the first time in an accelerator experiment CMOS monolithic active pixels (MAPS). The two innermost layers at a radius of 2.7cm and 8 cm from the beam line are constructed with 400 high resolution MAPS sensors arranged in 10-sensor ladders mounted on 10 thin carbon fiber sectors giving a total silicon area of 0.16 m². Each sensor consists of a pixel array of nearly 1 million pixels with a pitch of 20.7 μ m with column-level discriminators, zero-suppression circuitry and output buffer memory integrated into one silicon die with a sensitive area of \sim 3.8 cm². The pixel detector has a low power dissipation of 170 mW/cm², which allows air cooling. This results in a global material budget of 0.5% radiation length per layer for detector used in this run. A novel mechanical approach to detector insertion allows for the installation and integration of the pixel sub detector within a 12 hour period during an on-going STAR run. The detector specifications, experience from the construction and operation, lessons learned and initial measurements of the PXL performance in the 200 GeV Au-Au run will be presented.

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