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Production and performance of the silicon sensor and custom readout electronics for the PHENIX FVTX Tracker

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The Forward Silicon Vertex Tracker (FVTX) upgrade for the PHENIX detector at RHIC will extend the vertex capability of the central PHENIX Silicon Vertex Tracker (VTX) to forward and backward rapidities, (η), and also extend the reach in the low momentum-fraction region, (x). The FVTX is designed with adequate spatial resolution to separate decay muons coming from the relatively long-lived heavy quark mesons (Charm and Beauty), from prompt particles and the longer-lived pion and kaon decays that originate at the primary collision vertex. These heavy quarks can be used to probe the high density medium that is formed in Au+Au collisions at RHIC. The FVTX will also be used to study the spin structure of the proton. The FVTX is designed as two endcaps. Each endcap is comprised of four silicon disks covering opening angles from 10 to 35 degrees to match the existing muon arm acceptance. Each plane consists of p-on-n, silicon wedges, with ac-coupled mini-strips on 75μm radial pitch and projective length in the phi direction that increases with radius. A custom front-end chip, the FPHX, has been designed for the FVTX by the ASIC Design Group at Fermilab. The chip combines fast trigger capability with data push architecture in a low power design. The performance of the sensors and readout chip are described in technical detail.