Improving Efficiency of Active Pixel Sensors through Digital Signal Processing JEFFREY LEVESQUE, Rensselaer Polytechnic Institute, HOWARD MATIS, Lawrence Berkeley National Laboratory, STAR COLLABORATION — High energy nuclear collisions at the Relativistic Heavy Ion Collider (RHIC) produce an abundance of subatomic particles. STAR, one of four experiments at RHIC, currently has modest capabilities for detecting heavy flavor hadrons. By upgrading STAR with an active pixel sensor (APS) detector, we can significantly improve its ability to measure these short-lived particles. High detection efficiency for heavy flavor will allow measurements of quark thermalization and flow. This will lead to a better understanding of the hot, dense system of matter created in collisions, presumably quark-gluon plasma. Our group is investigating several algorithms and digital signal processing techniques to determine which are best for detecting minimum ionizing particles in APS data. We obtain actual noise data from prototype APS chips at expected leakage current levels, and then embed Monte Carlo charge distributions within the noise to simulate particle hits. Efficiencies of the signal extraction methods are quantitatively compared. We will present the results of these investigations.

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