

## **Updated track fitting and alignment method for the silicon tracking telescope at the Fermilab Test Beam Facility**

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The silicon tracking telescope at the Fermilab Test Beam Facility (FTBF), located at the Fermi National Accelerator Laboratory in Batavia, Illinois, provides precise track fitting information to users wishing to test how new detectors will perform after being exposed to large amounts of radiation. This task is becoming increasingly important with the High Luminosity Large Hadron Collider (HL-LHC) upgrade on the horizon, which will provide ten times the luminosity of the current LHC and require new detectors to be notably more impervious to radiation. In order to improve the precision of the telescope, an updated track fitting method for the telescope has been implemented. The update is based on a Kalman filter to account for the probability of multiple scattering off of device material and improve the handling of errors in the track fitting process. The resolution and error handling of the updated method is compared to the original  $\chi^2$  minimization fit method. It is found that when scattering probability is introduced into the Kalman filter, both the residuals and pull values for most detectors move away from the desired values. Despite that, when no multiple scattering is assumed, the Kalman filter improves residuals and pulls for most detectors. For this reason, the Kalman filter will replace the standard track fitting method in future analyses, though further study is needed in order to account for the probability of scattering.