Abstract Submitted
for the 4CS21 Meeting of
The American Physical Society

**Analyzing Silicon Pixel Sensor Efficiencies for the HL-LHC Upgrade with a Desktop Pixel Telescope and Beta-Emitter** LIAM FOSTER, STEPHEN WAGNER[1], University of Colorado, Boulder — The HL-LHC upgrade necessitates radiation hardness improvements of Inner Tracker pixel sensors and provides opportunities to leverage improvements in silicon manufacturing technologies. A primary indicator of radiation hardness is sensor efficiency after irradiation. In order to measure sensor efficiencies for the HL-LHC upgrade, a pixel telescope was constructed to use Rh-106 and Y-90 betas for detector under test (DUT) analysis in place of a test beam. Stringent cooling requirements of irradiated sensors necessitate the use of a heat sink, so the DUT is placed at the bottom of the telescope. This demands a robust statistical analysis to produce useful results. Thus, a toy Monte Carlo (MC) model of the telescope was developed and used to generate PDFs of multiple Coulomb scattering angles. These PDFs are used to calibrate a separate analysis package which integrates the PDFs over a given scattering angle projected onto the DUT. Summing the contribution from each event gives an expected number of hits with scattering angles lower than a given threshold. By comparing the expected and measured hits in a given threshold, an efficiency is obtained. This method is still in the development phase, but shows promise when applied to simulated data generated via the MC model.

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Date submitted: 08 Sep 2021 Electronic form version 1.4