OBJECTIVE:

Characterize protons reaching the detector and determine how gold metallization on silicon affects detection parameters.

BACKGROUND:

The world average of neutron lifetime is approximately 15 minutes. However, the beam method and the ultracold neutron storage method gave the average value that currently differs by 8.7 seconds (4 standard deviations). The BL3 experiment at the NIST aims to improve the precision of one of the beam-type measurements to resolve this discrepancy. The present goal is to decrease uncertainty in the experiment to 3 seconds.

METHODS:

Compare simulation tools Kassiopeia, SRIM, PySrim to assess performance of protons in trap area in meter scale for Kassiopeia and nano scale for SRIM.

1. Kassiopeia-based: Simulate 35keV protons in a quasi-Penning trap of mirror electrodes at +800V, central trap electrodes at 0V, and door electrodes at +800V to determine distribution, trap efficiency. The length of trap is 2m.

2. SRIM-based: Simulate 35keV Hydrogen atom to 5000A target layer with different material to determine energy deposition, dead layer effects, and charge sharing in the proton detector. The thickness of detector is 5000A.