- **RATIONALE:**

  PET scans are used to characterize disease progression in real time and space. PET scanners are limited by low spatial resolution, making it hard to discern between small brain tumors and healthy tissue scan images. A contributing factor to low spatial resolution is low depth of interaction resolution, which the variance of a depth of interaction measurement.

- **RESEARCH QUESTION(S), HYPOTHESIS(ES), ENGINEERING GOAL(S), EXPECTED OUTCOMES:**

  PET modules consist of scintillator arrays. A scintillator is a special material that can convert high-energy gamma rays into thousands of low-energy optical photons. I want to see how partial surface roughening of the lateral surfaces of these scintillators can improve depth of interaction resolution by controlling light output. Depending on where the gamma ray converts inside the scintillator, the degree of light shared changes. This can be described using a variable ‘w’—I will be looking for certain trends in this variable.

- **Procedures:** Detail all procedures and experimental design including methods for data collection. Describe only your project. Do not include work done by mentor or others.

- I will use Trace Pro, a Monte Carlo ray-tracing software, to run simulations on the light dynamics inside PET modules. I will use Trace Pro’s features to make changes to the simulated module and see how they affect light movement inside.
- I may also do experimental tests with PET modules and record their light output by connecting a cable from the module to a computer.

- **Risk and Safety:** Identify any potential risks and safety precautions needed. I will be in proximity of radioisotope Sodium-22. As safety precautions, the isotope with either be in suitable container or encased in a two inch thick lead cylinder. The isotope and the lead will also primarily be in a gamma-ray proof fridge. As for the lead, it will only be touched when wearing lab gloves.

- **Data Analysis:**

I will use MatLab to record and analyze my results.

- **BIBLIOGRAPHY:**

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