Update on Figure for DNP Talk

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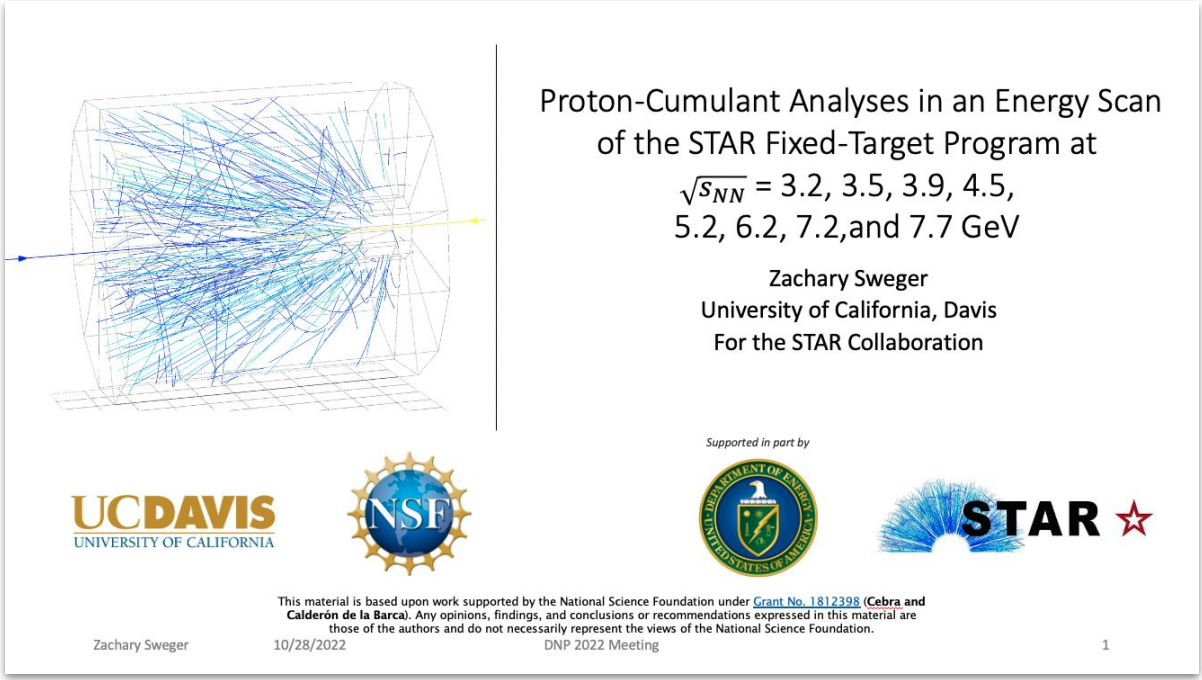
My talk for DNP

- I will be giving a talk at the Division of Nuclear Physics Meeting in New Orleans on October 28th
- I will present an overview of some aspects of the proton fluctuations analyses for the Fixed-Target Program, without showing any physics results



Significance Figure

- I wanted to present a figure which demonstrates the statistical improvements achieved in BES-II and the Fixed-Target Program

$$\text{Error}(C_4/C_2) \sim \frac{1}{\sqrt{N}}$$

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- But that would misrepresent how good the new data will be.
  - The significance of a signal in C_4/C_2 goes as the average of the cube of the number of protons in the acceptance window
  - This dominates the differences in significance at each energy

$$\text{Significance}(C_4/C_2) \sim \langle N_p^3 \rangle$$

"The STAR Beam Use Request for Runs 19 and 20"
https://drupal.star.bnl.gov/STAR/system/files/bur2018-final_0.pdf

- We take the average number of protons predicted at each energy and cube this to give an approximate scaling of the significance

$$\text{Approximate Significance}(C_4/C_2) \sim \langle N_p \rangle^3$$

Significance Figure

- The metric I'm using to approximate the improvement in significance for a measurement of a C4/C2 signal due to statistical improvements, but moderated by the number of detected protons is:

$$\frac{\langle N_p \rangle^3}{27^3} \frac{\sqrt{N_{\text{events}}}}{\sqrt{5\text{M}}}$$

Average number of protons at 7.7 GeV (collider)

Number of events for 7.7 GeV BES-I

Proposed Figure