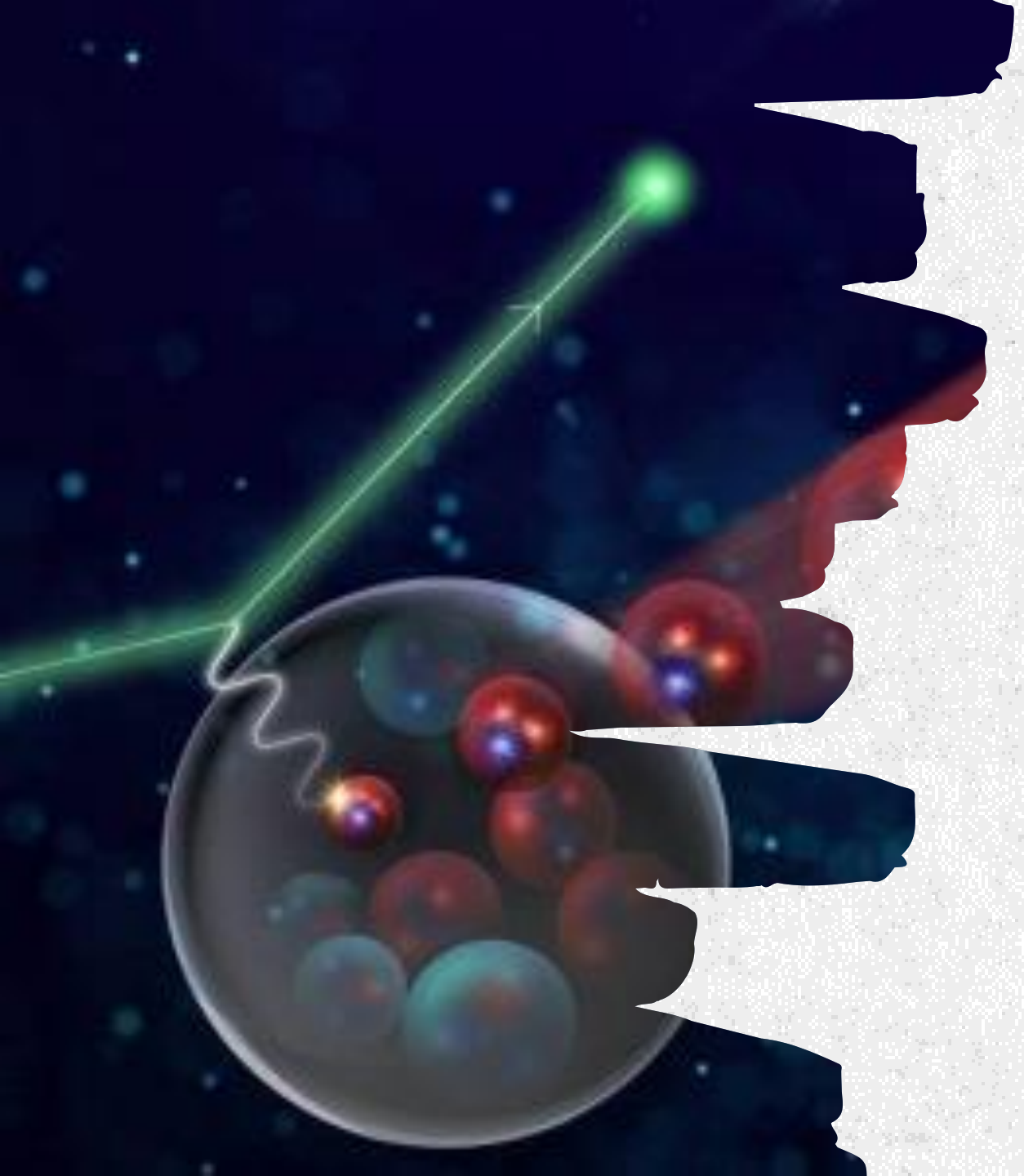

NUCLEAR TRANSPARENCY

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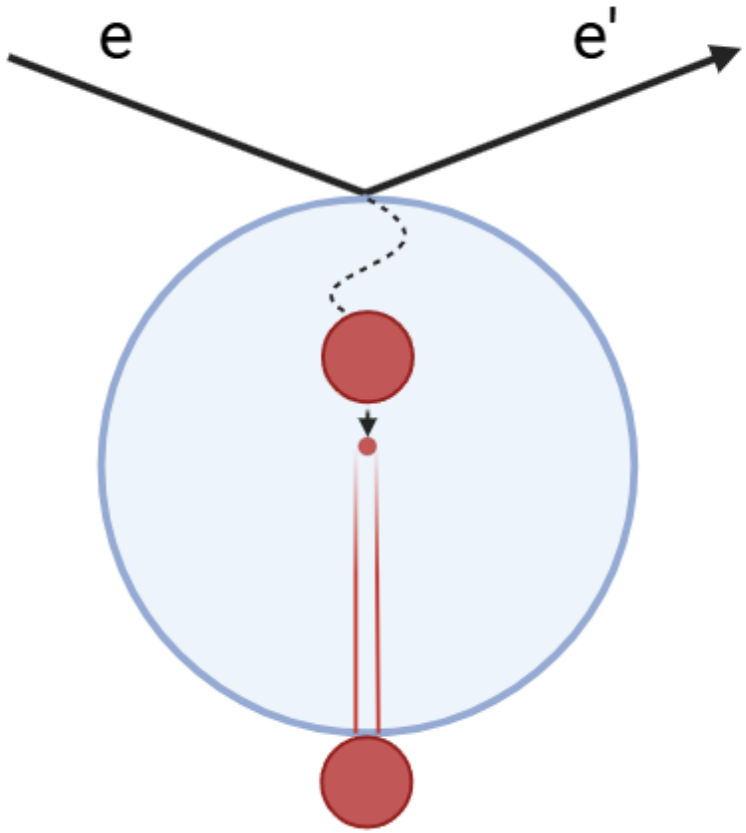
OPTICAL TRANSPARENCY

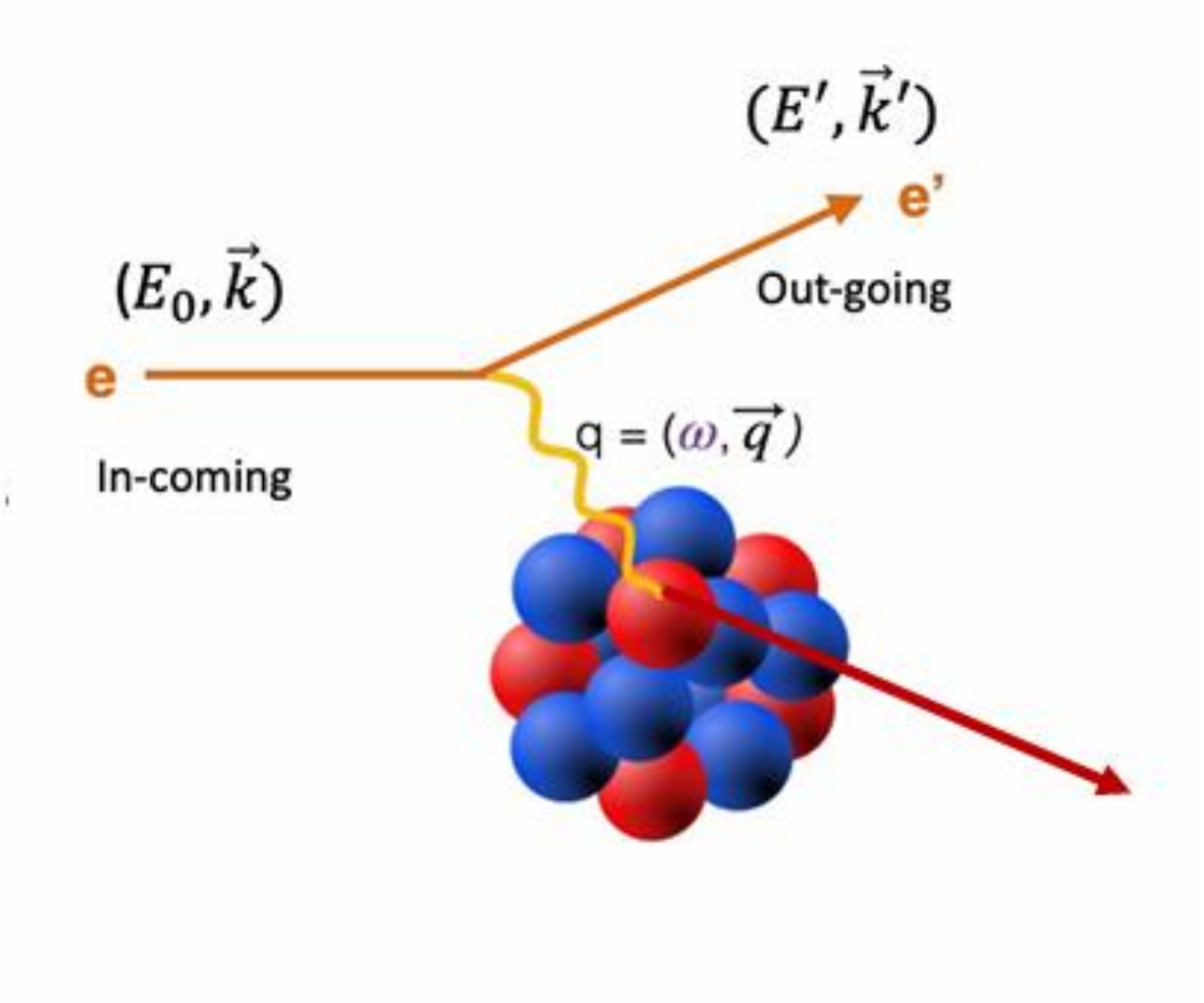
- Optical Transparency is what we typically think of when we think that something is transparent, otherwise see-through.
- The reason that this “see-through” phenomenon occurs is due to the light gong through the medium with no interactions (or little to no interactions) from the medium, thus no absorption or scattering.

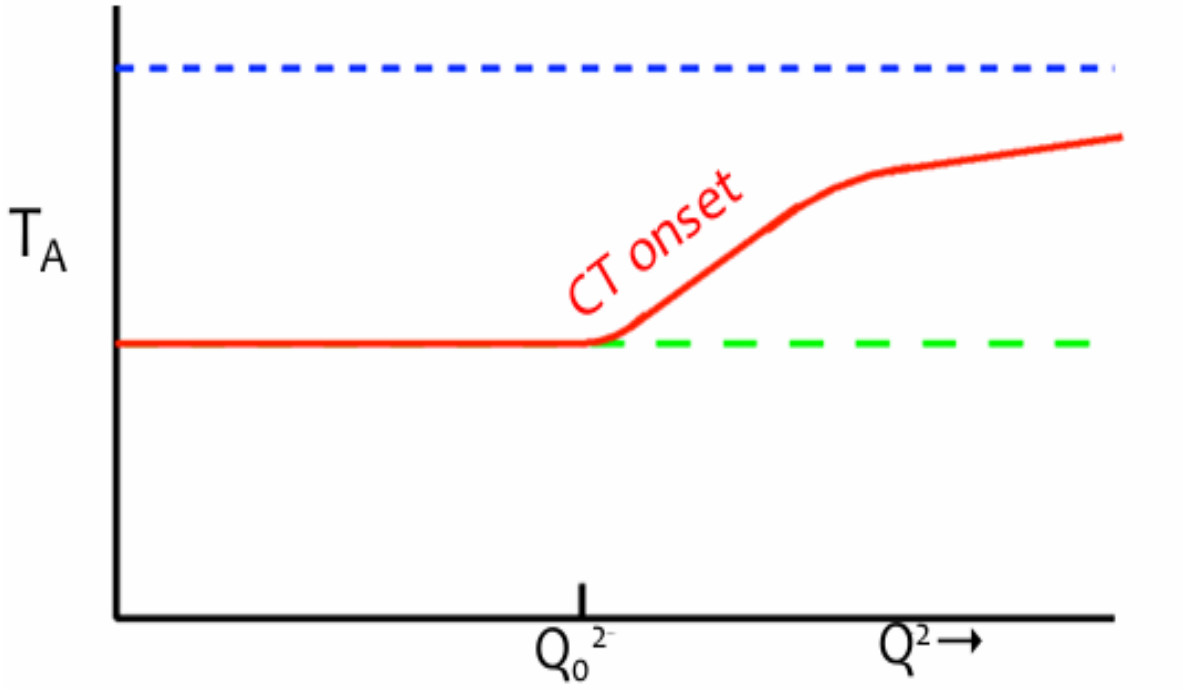
COLOR TRANSPARENCY

- Color transparency is when at high momentum transfers during exclusive processes, the hadron-nucleon interaction for hadrons inside of a nucleus disappears.
- Three requirements:
  - Squeezing: hadron has fluctuated to reduced size, PLC.
  - Color screening: reduced interaction as hadron exits the nucleus.
  - Freezing: hadron maintains small PLC/no reduction in final state interactions.



NUCLEAR TRANSPARENCY





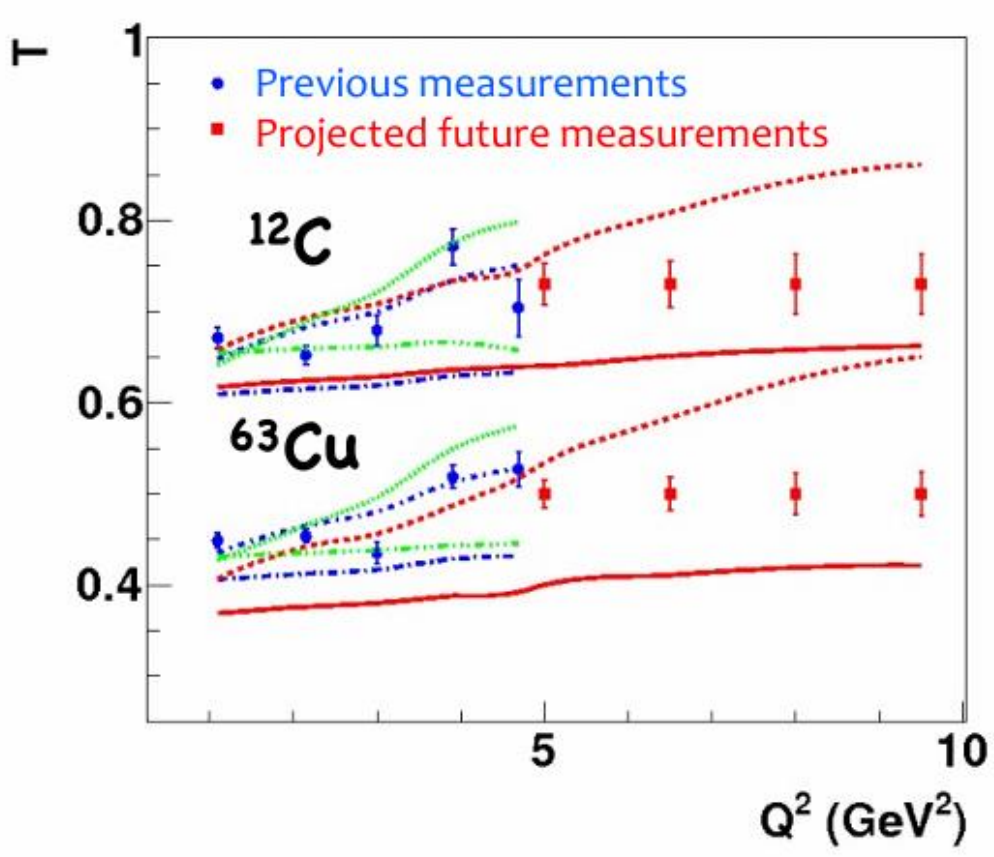
$$T_A = \frac{\sigma_A}{A\sigma_N}$$

UPCOMING EXPERIMENT/SIGNIFICANCE

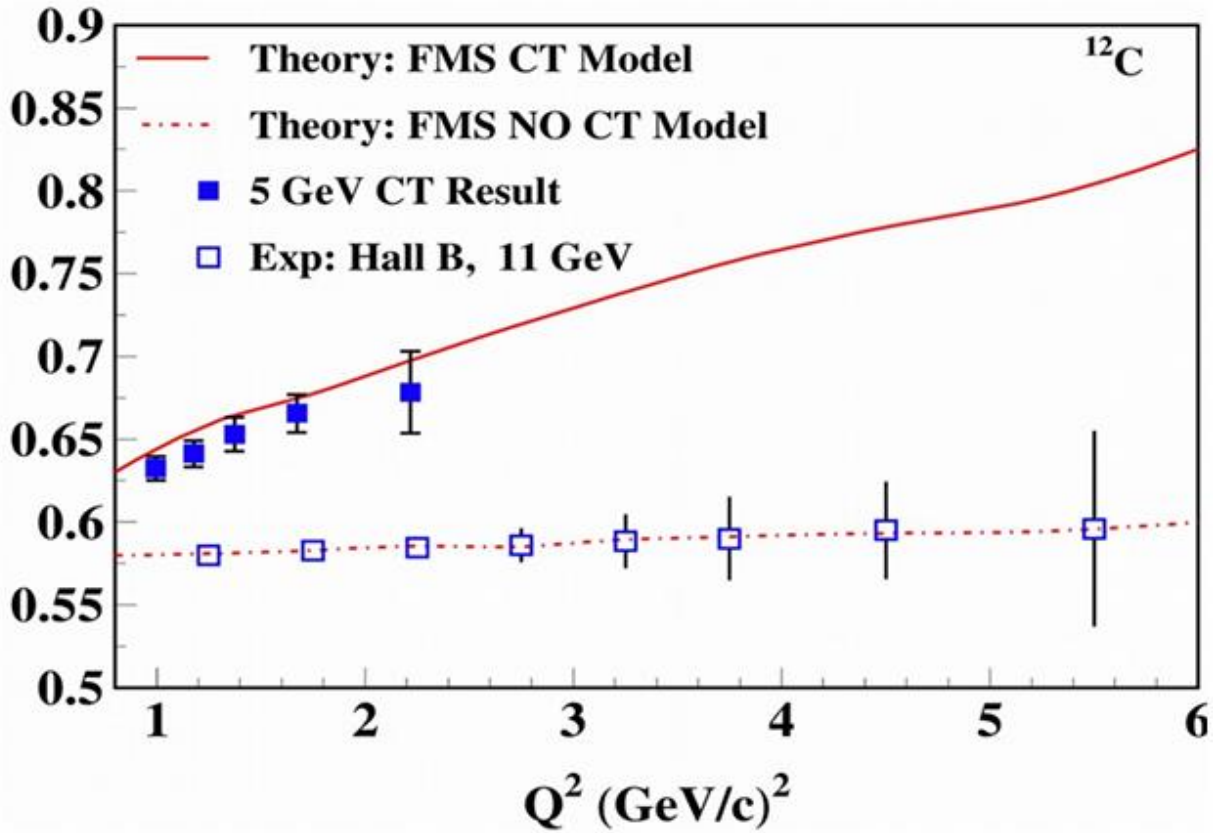
- Upcoming J-Lab experiment in Fall 2025 where the measurements for pions, protons, and rho mesons will be extended at higher Q^2.
- For mesons, the onset trend should continue. While for baryons, there has not yet been any onset so the purpose of extending the Q^2 is to see if an onset can be observed.
- One of the main importances of seeing nuclear transparency in hadrons is to connect two frameworks with varying degrees of freedom via QCD predictions, in this case CT.

ONSET OBSERVED IN MESONS

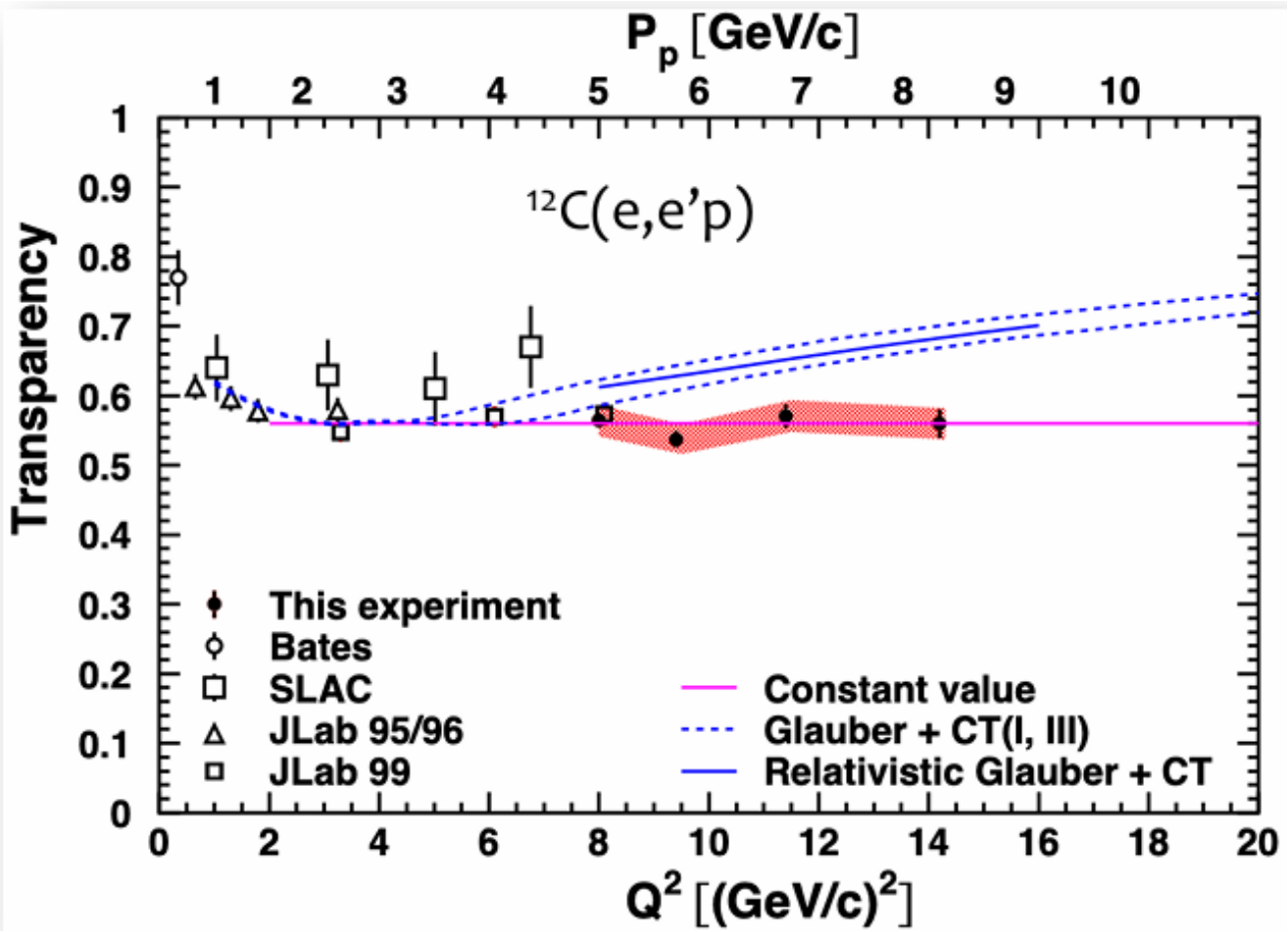
Pion Measurements



Rho Measurements

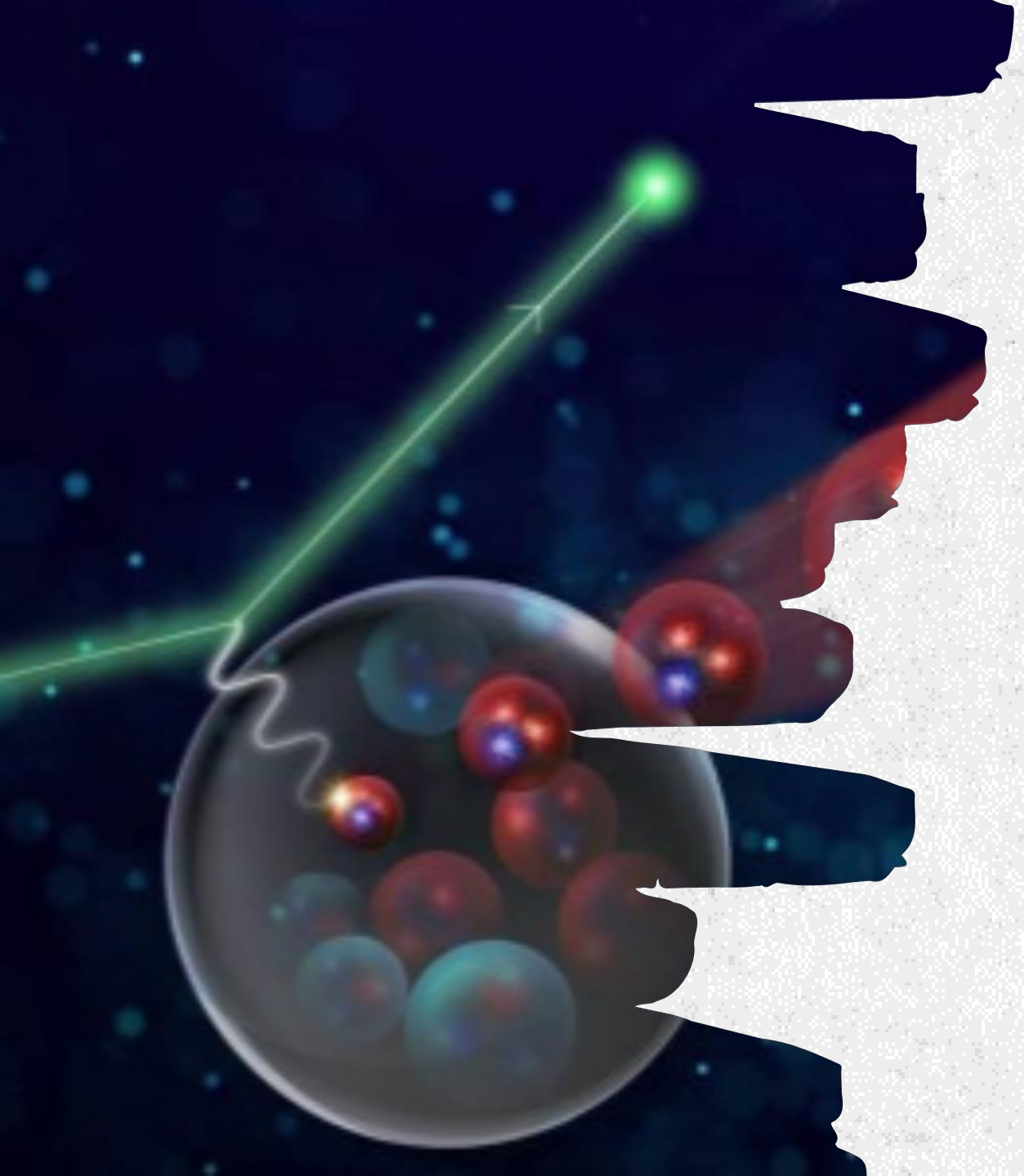


NO ONSET OBSERVED (YET) FOR PROTONS



RESOURCES

- IWHSS_CT_2024.pdf (cern.ch)
- *dissertation_bhetuwal_msu.pdf
- *physics-04-00045-v2.pdf
- Nuclear transparencies with a two-step process of the $A(e,e'\pi^+)$ reaction (arxiv.org)
- *Mark Thomson - Modern Particle Physics-Cambridge University Press (2013) 2.pdf



THANK YOU!

Questions?