

# $pp$ Elastic Scattering Studies for Phase 0 at HADES

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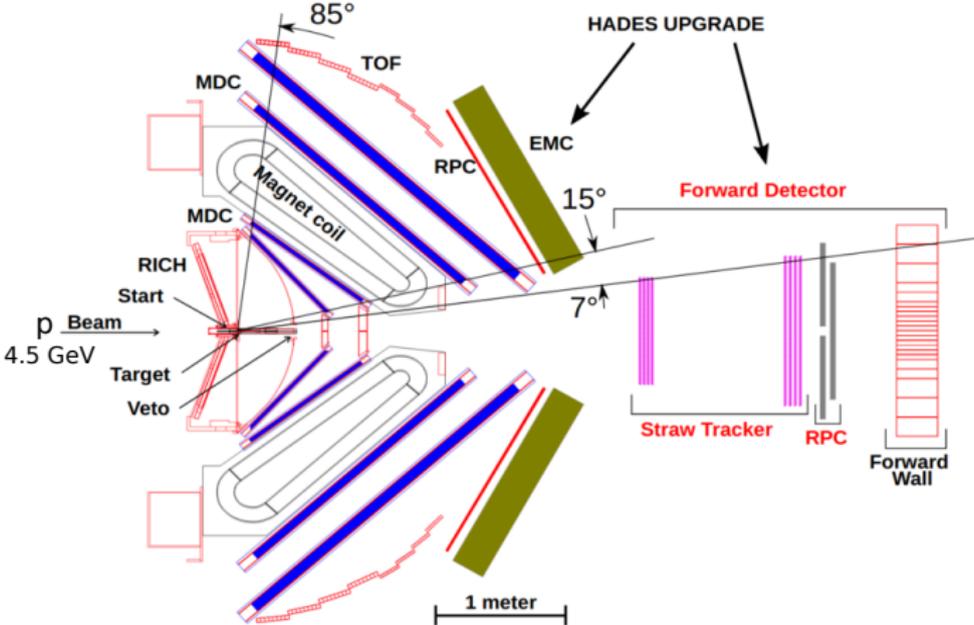
June 15th, 2021

Tracking Session

PANDA Collaboration Meeting 2 – 2021



# HADES Setup



Comissioning beam time February 2021

## Why Elastic Scattering?

- Very simple reaction, final state well defined
- One proton in main HADES, one in Forward Detector

What we can learn from this:

- Alignment of Forward Detector
- Conversion from time to momentum  
(no magnetic field in forward direction)

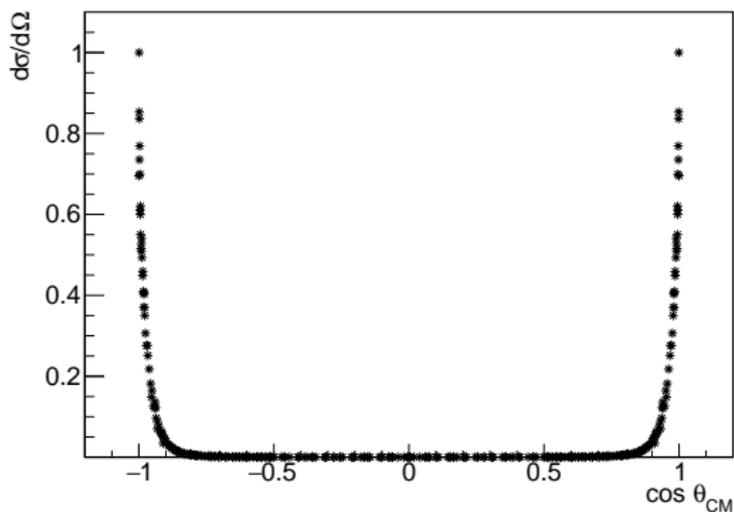
→ Do simulation study and compare with data from Feb21 beam time

## Angular Distribution

Use existing measurements to get differential cross section

- Data from SAID ([http://gwdac.phys.gwu.edu/analysis/nn\\_analysis.html](http://gwdac.phys.gwu.edu/analysis/nn_analysis.html))
- Utilize available data from  $T_{\text{lab}} = 4 \text{ GeV} - 4.4 \text{ GeV}$

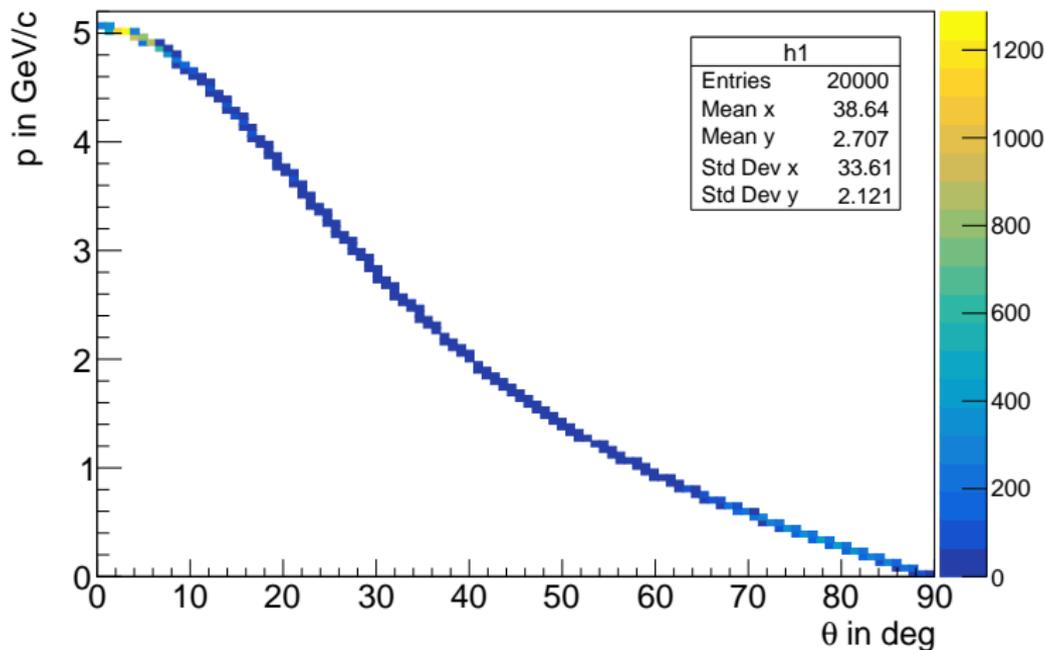
Data from SAID



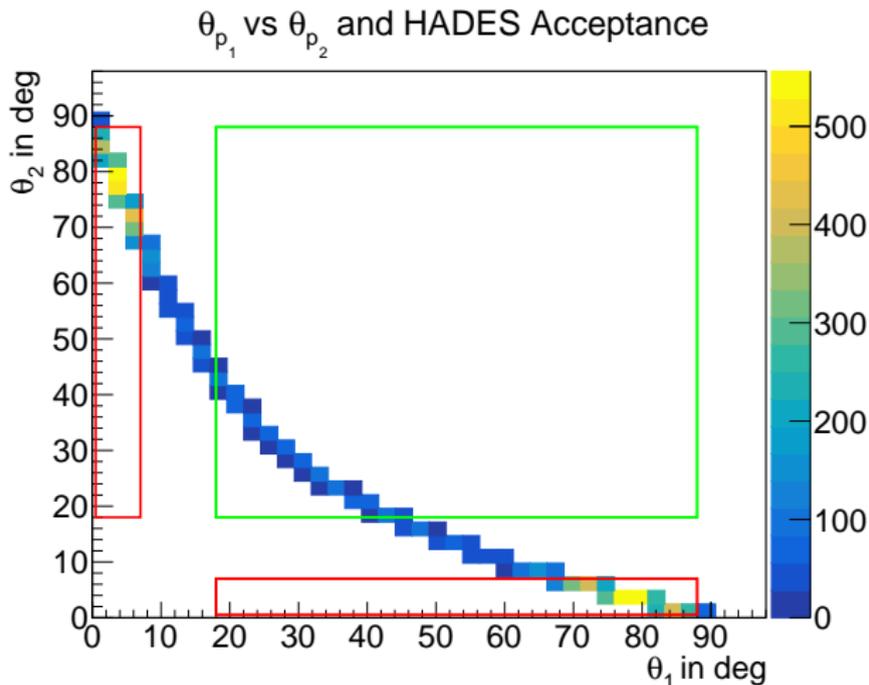
# Scattered Protons

Pluto simulation at 4.2 GeV beam kinetic energy

mom vs.  $\theta$  in lab



# HADES Acceptance



Both protons in HADES:  $\approx 10\%$

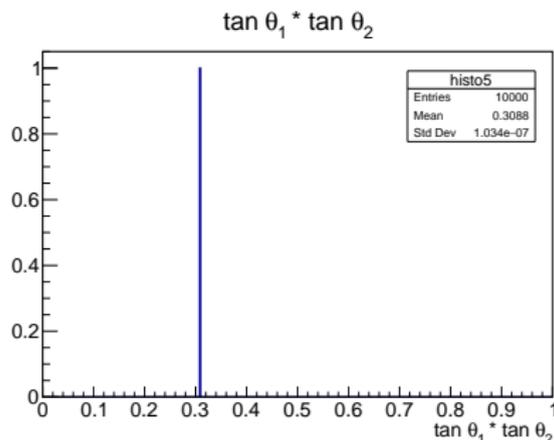
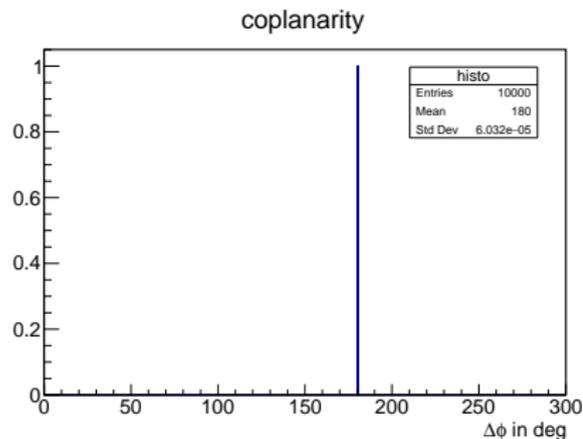
One in FW Det, one in HADES:  $\approx 70\%$

## Some Kinematics

**Coplanarity**  $\phi_{p_1} - \phi_{p_2} = 180^\circ$

$$\gamma_{\text{CM}} = \frac{\sqrt{s}}{2m_p} = 1.8$$

$$\tan \theta_1^{\text{lab}} \cdot \tan \theta_2^{\text{lab}} = \frac{1}{\gamma_{\text{CM}}^2} = 0.3088$$



→ Can be used to select for elastic scattering events

# Outlook

- Complete full simulation
- Do realistic event reconstruction
- Compare with data from Feb21 commissioning beam time
- Check alignment of FwDet wrt main HADES, determine required precision
- Resolution of time to momentum conversion

Any further suggestions?