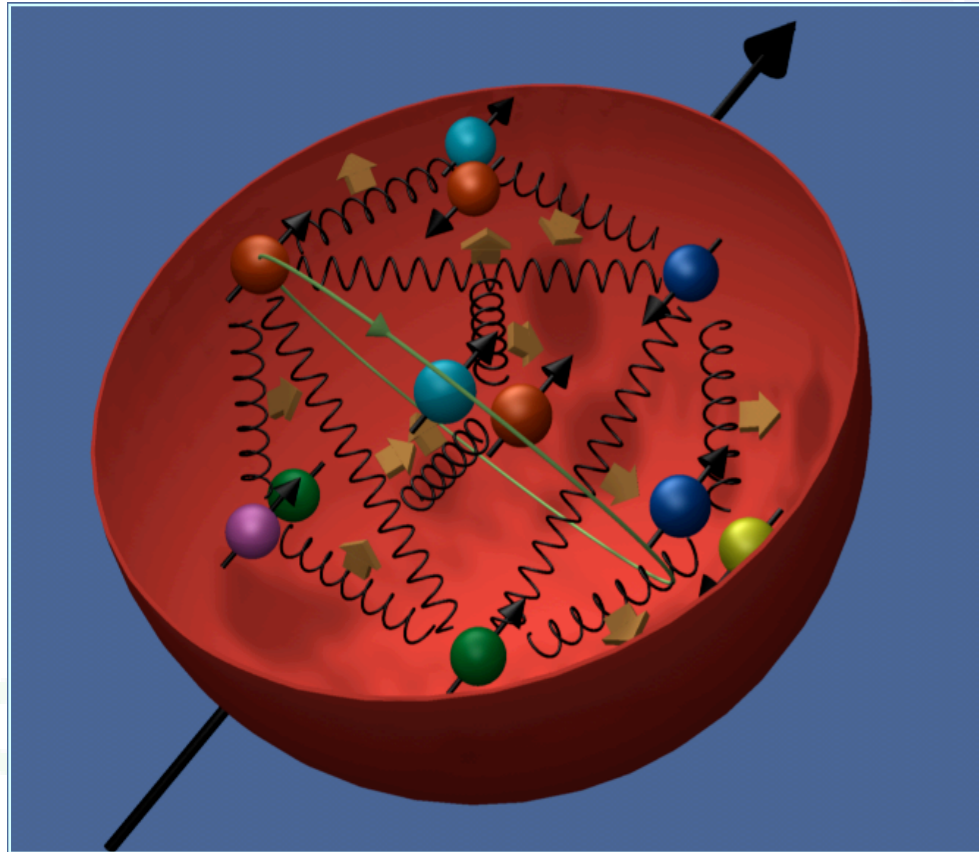




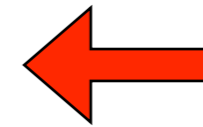
Report from hermes

G. Schnell (DESY Zeuthen)
67. DESY PRC Meeting, May 5th, 2009

[conclusions at DIS 2009]

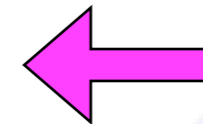


$$\frac{1}{2} = \frac{1}{2} \Delta\Sigma$$



quark spin

$$+ \Delta G$$



gluon spin

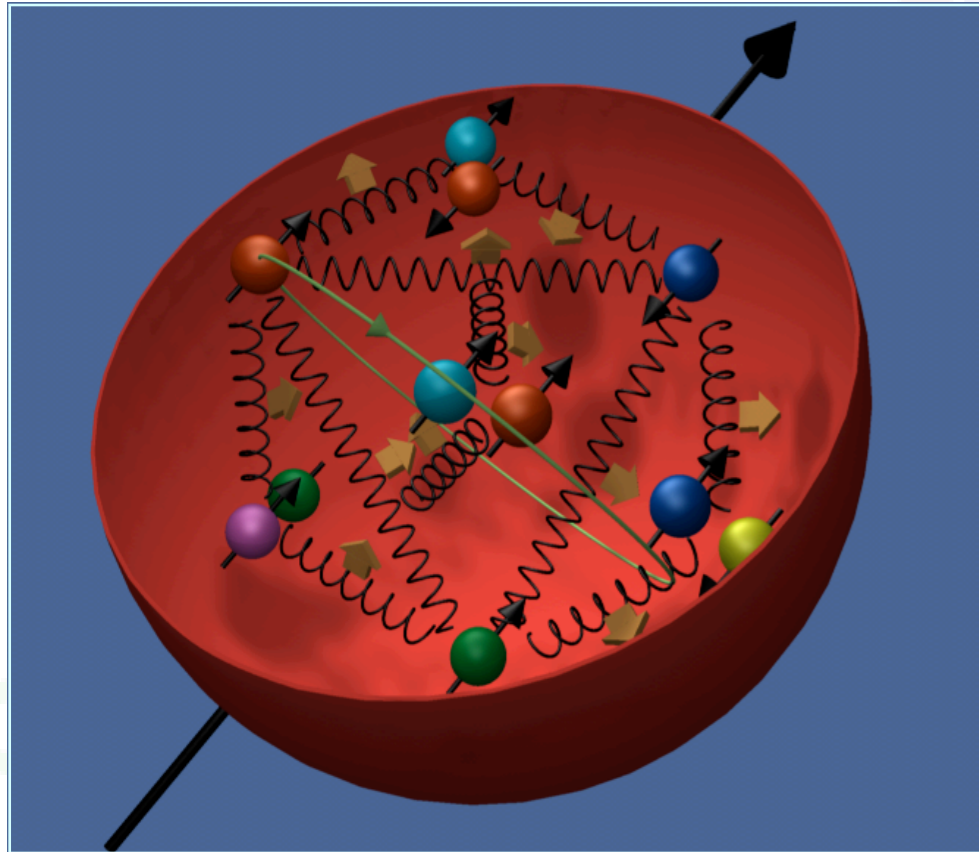
$$+ L_q + L_g$$



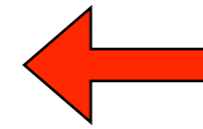
orbital angular
momentum

"the spin crisis is solved but ..."

[conclusions at DIS 2009]

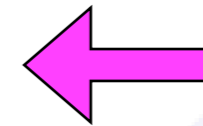


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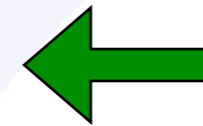
quark spin

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gluon spin

$$+ L_q + L_g$$



orbital angular momentum

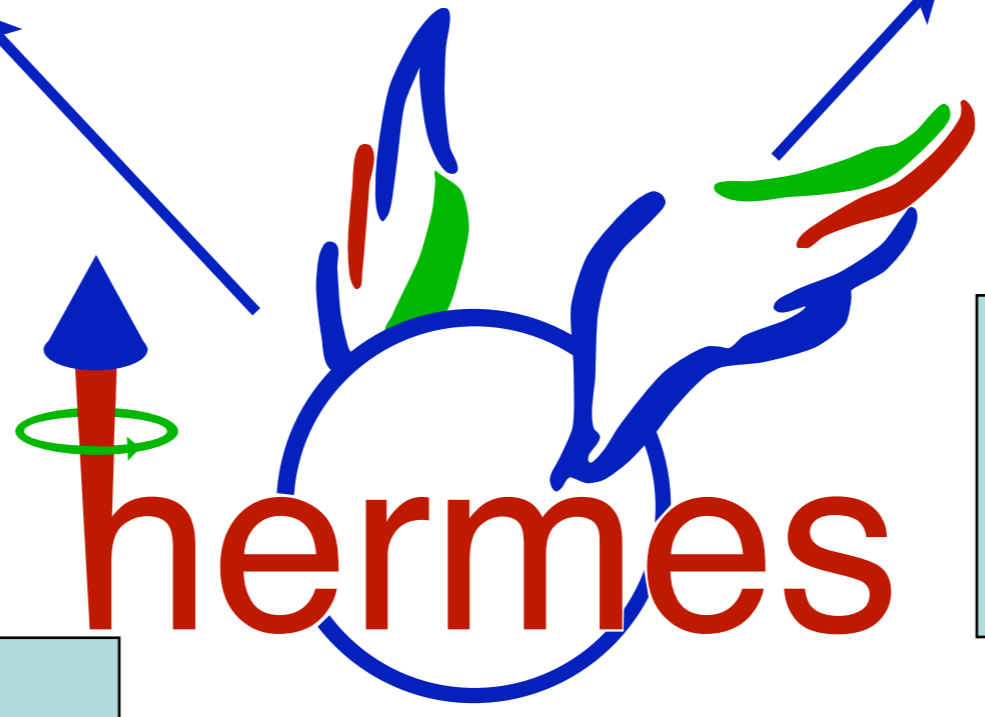
“the spin crisis is solved but ...

the proton spin is still a puzzle”

*Longitudinal Spin/
Momentum Structure,
Hadronization*

*Transverse Spin/
Momentum
Structure*

DVCS



hermes

**Transversity
TMDs**

**GPDs
“Nucleon Tomography”**

*Exclusive Meson
Production*

*Strange-Baryon
Production*

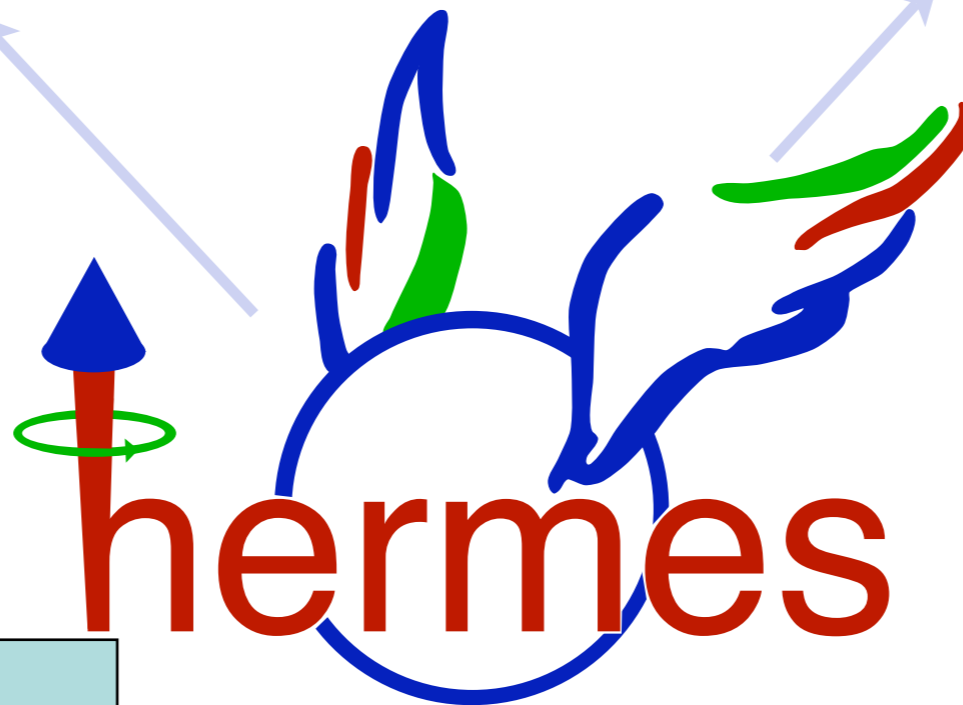
Physics Highlights since last PRC Mtg.

- **SDMEs in exclusive ρ^0 electro-production on H and D targets**
arXiv:0901.0701 (accepted by EPJC).
- **Preliminary results released:**
 - **Transverse SDMEs in exclusive ρ^0 production**
 - **Transverse SSA in exclusive ω production**
 - **Nuclear-mass dependence of transverse Λ polarization**
 - **Structure function F_2 on H and D targets**

*Longitudinal Spin/
Momentum Structure,
Hadronization*

*Transverse Spin/
Momentum
Structure*

DVCS



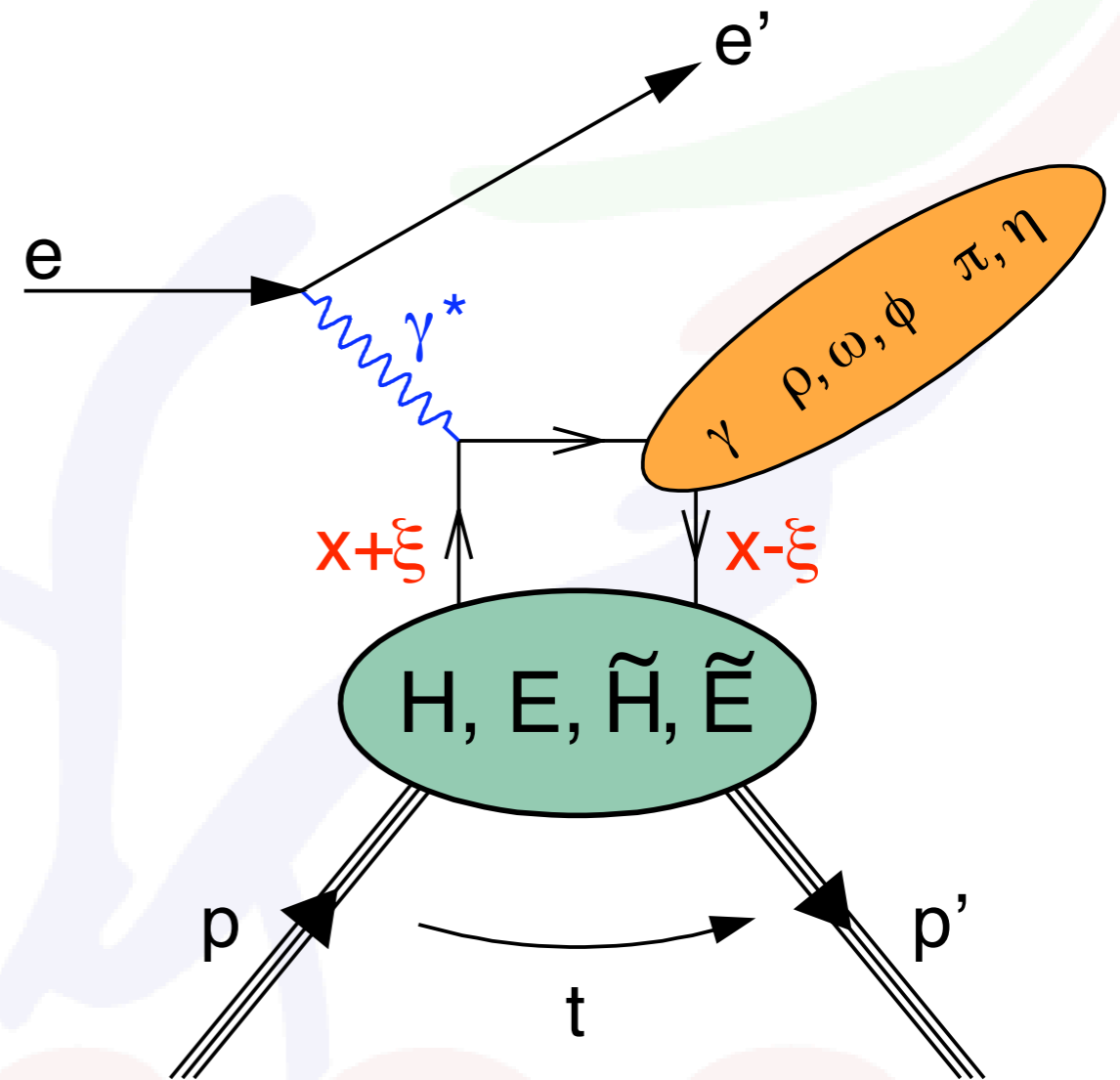
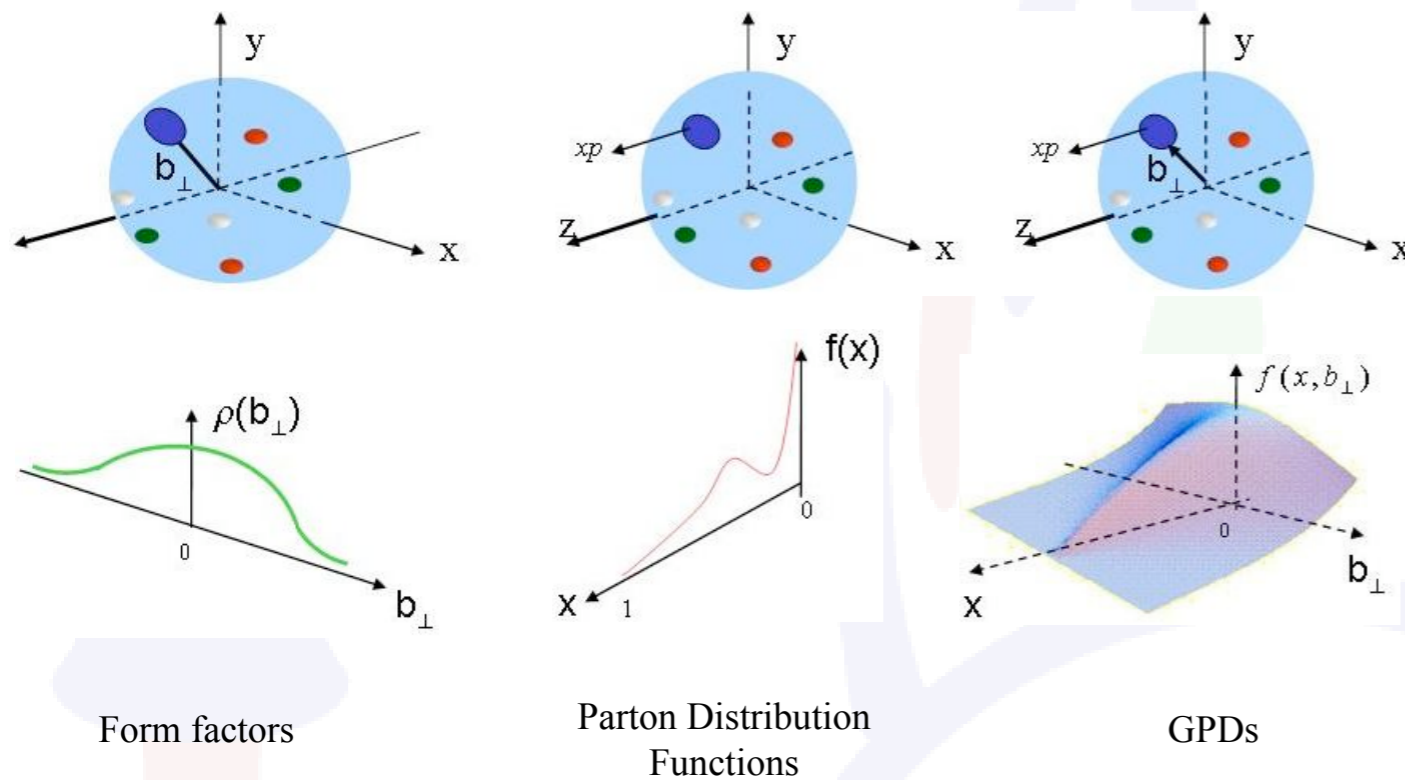
**Transversity
TMDs**

**GPDs
“Nucleon Tomography”**

*Exclusive Meson
Production*

*Strange-Baryon
Production*

Probing GPDs in Exclusive Reactions

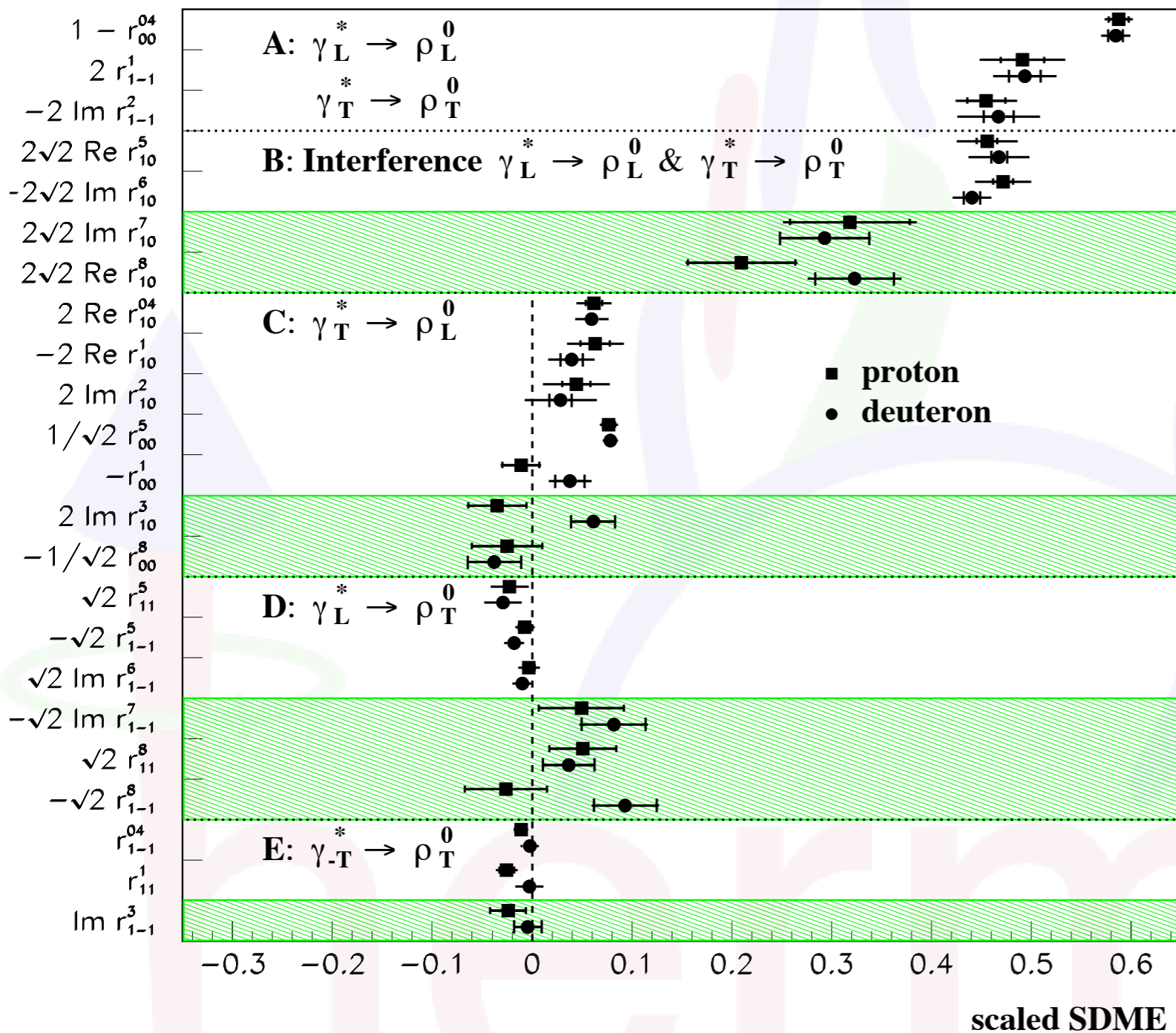


Accessible through hard exclusive reactions:

unpolarized	polarized
photon: $J^P = 1^-$ (DVCS)	
H	\tilde{H}
E	\tilde{E}
$J^P = 1^-$ mesons	$J^P = 0^-$ mesons

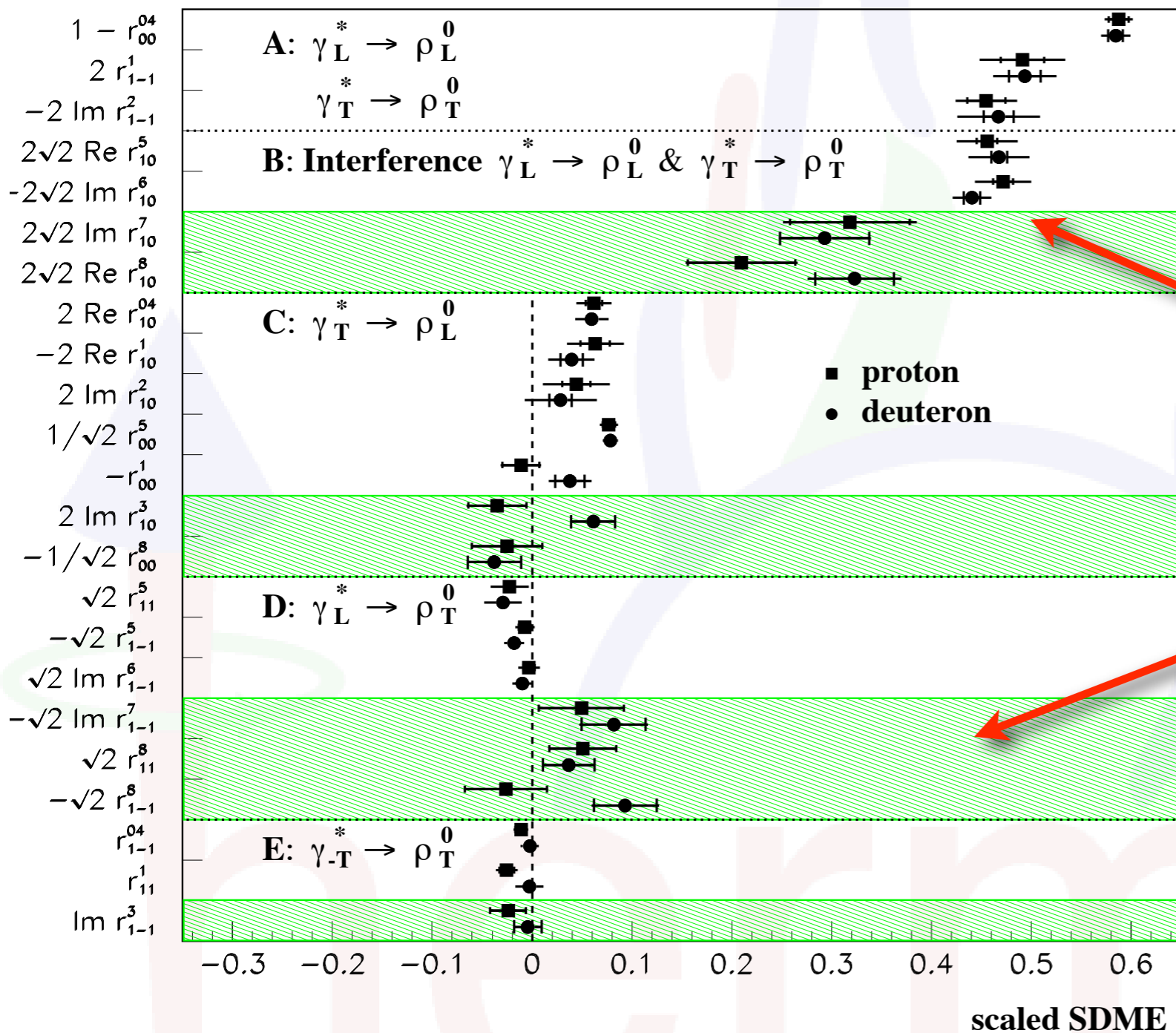
Different mesons provide different sensitivity to quark flavors

ρ^0 SDMEs from HERMES



target-polarization independent SDMEs

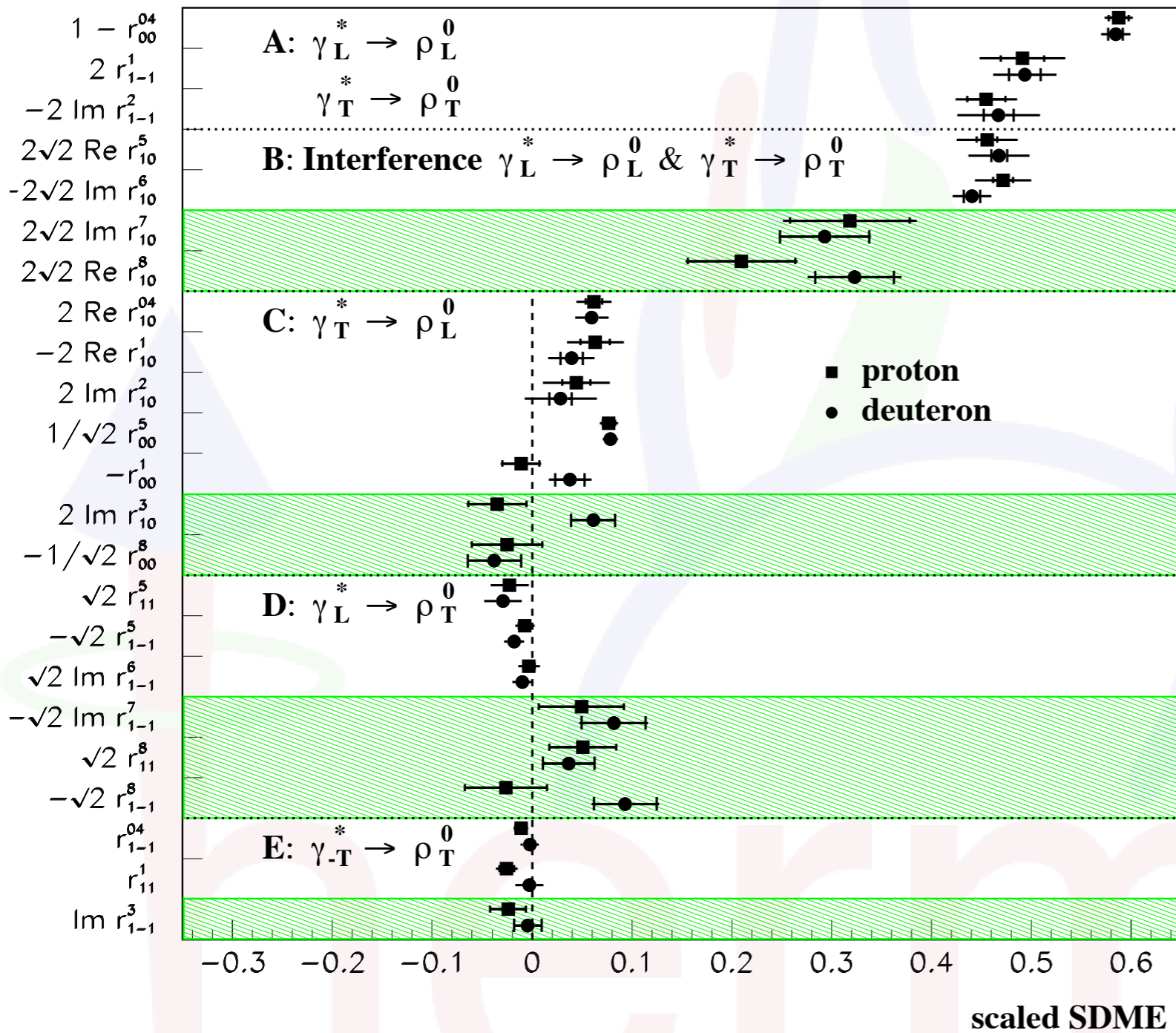
ρ^0 SDMEs from HERMES



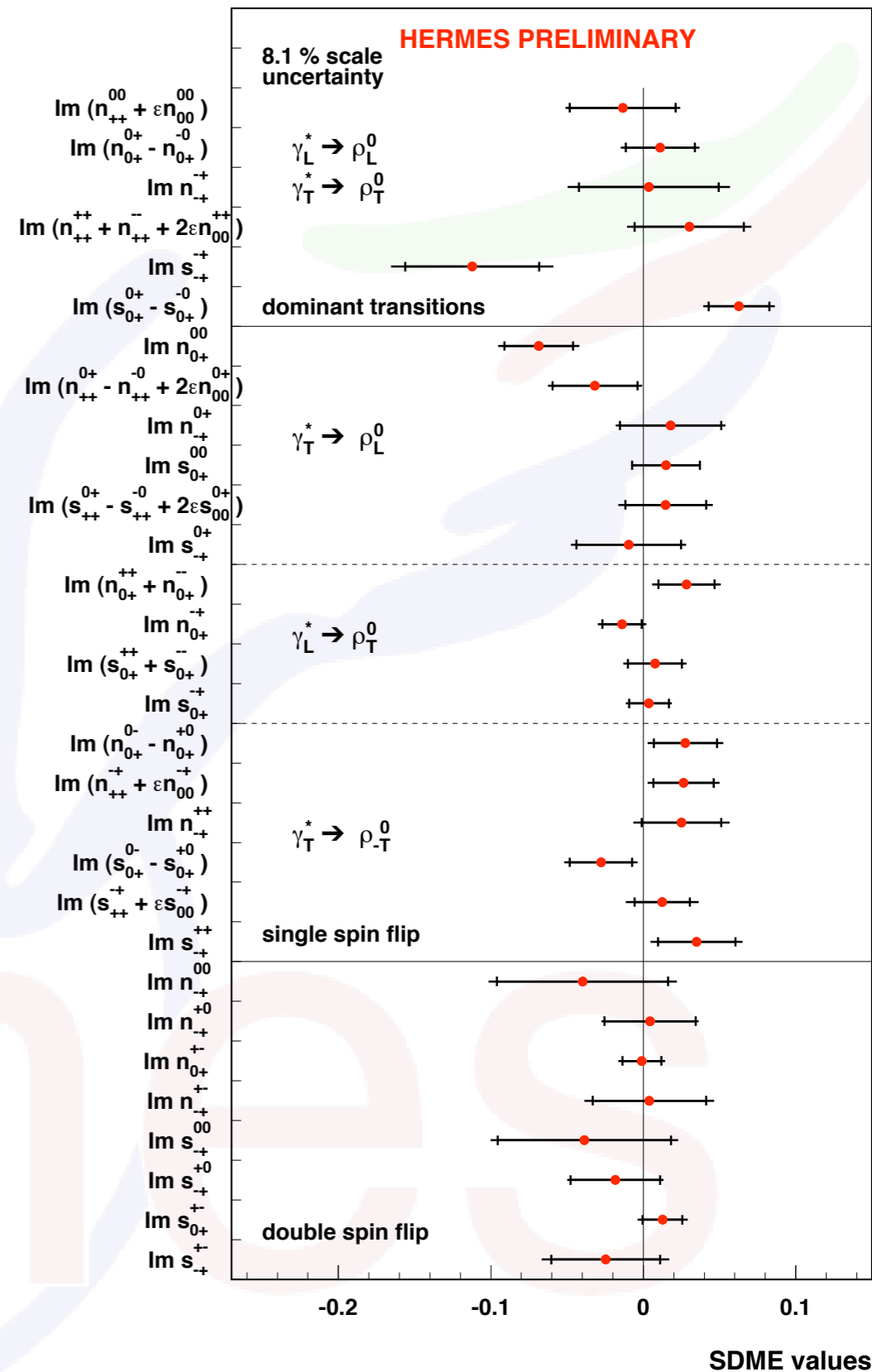
helicity non-flip much larger than helicity-flip and double helicity-flip

target-polarization independent SDMEs

ρ^0 SDMEs from HERMES

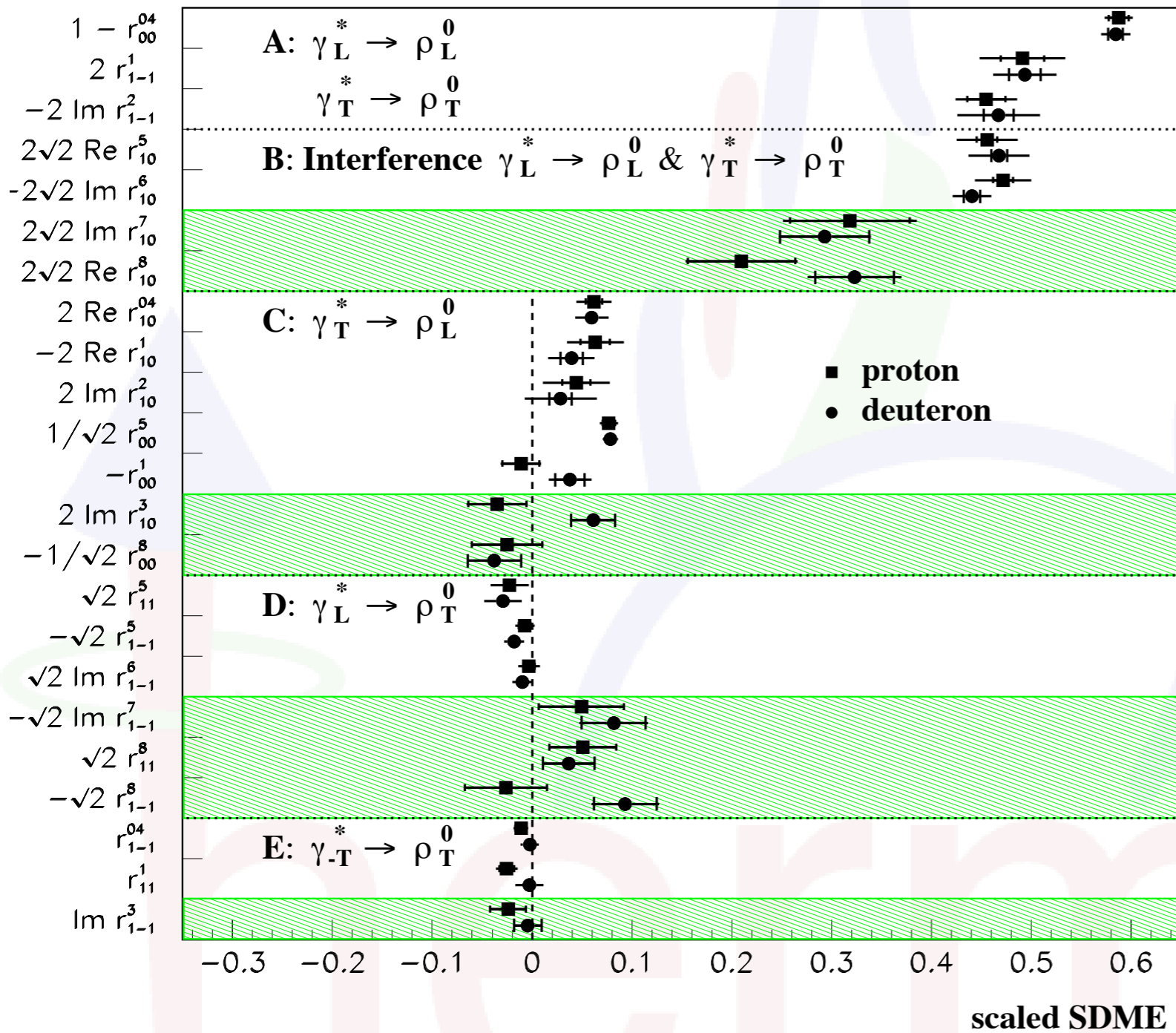


target-polarization independent SDMEs

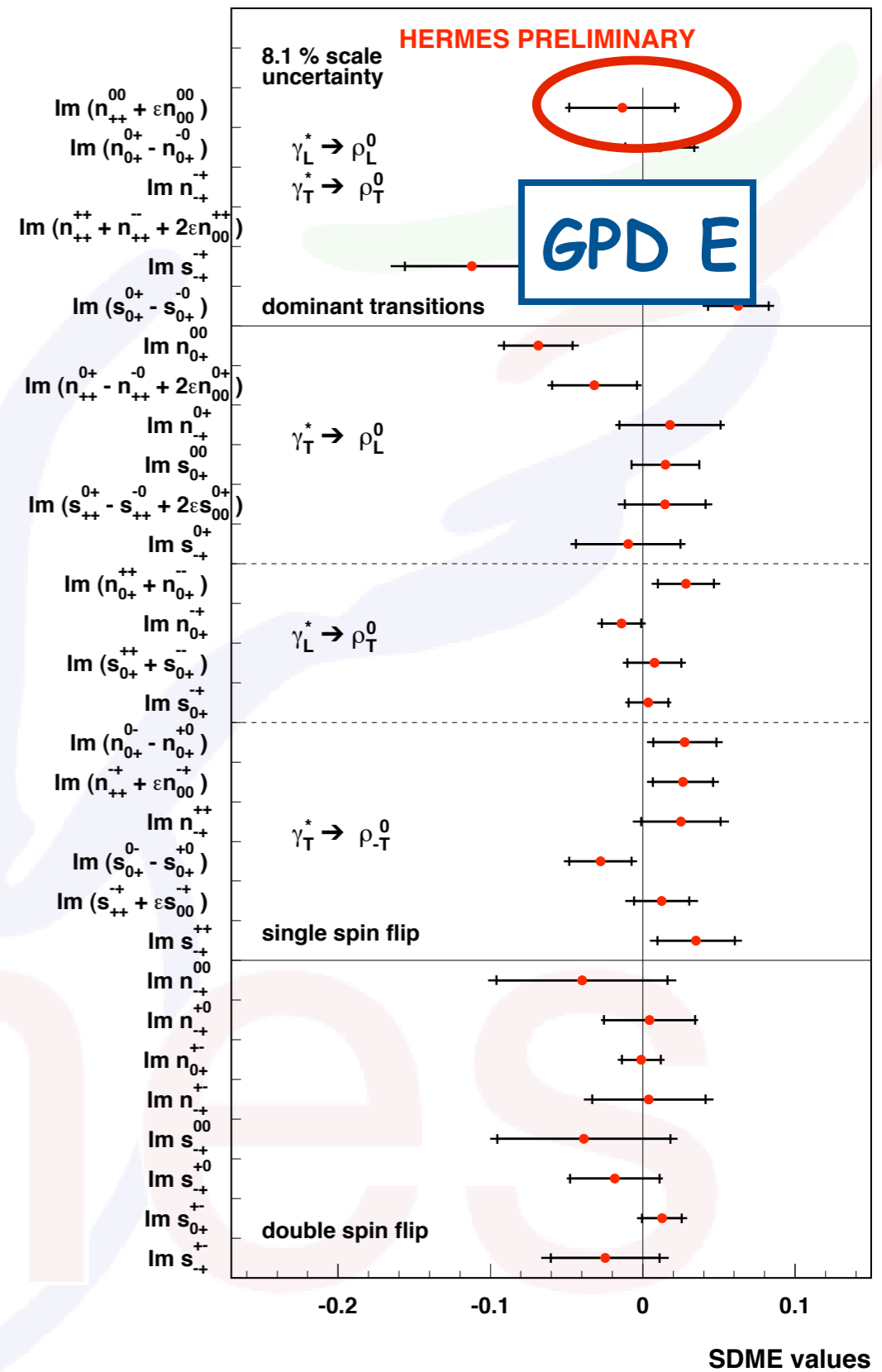


"transverse" SDMEs

ρ^0 SDMEs from HERMES



target-polarization independent SDMEs

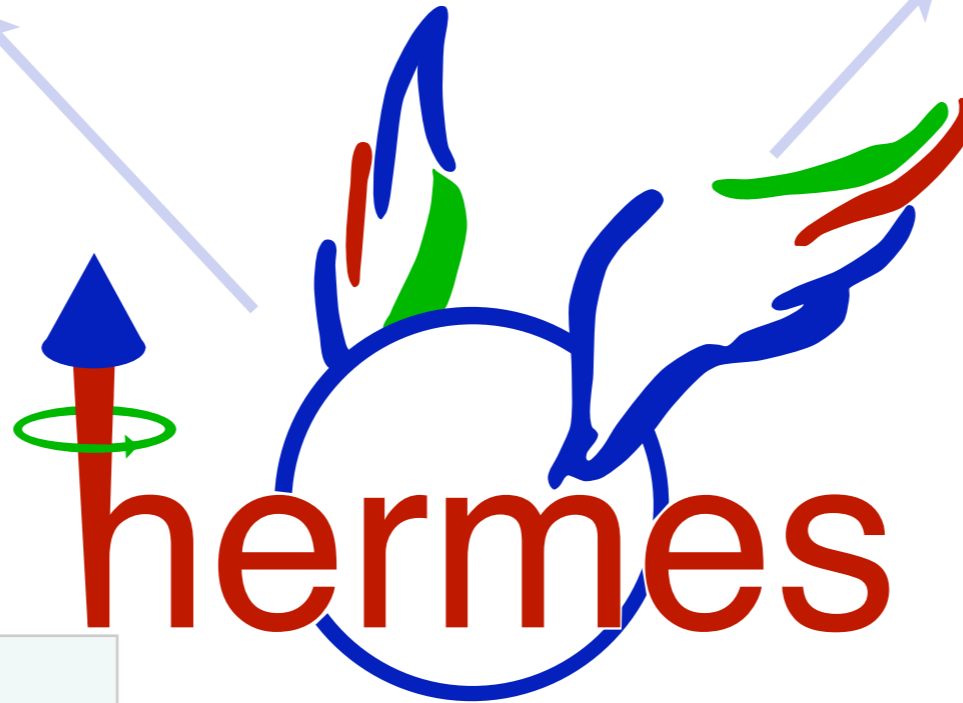


"transverse" SDMEs

*Longitudinal Spin/
Momentum Structure,
Hadronization*

*Transverse Spin/
Momentum
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DVCS



**Transversity
TMDs**

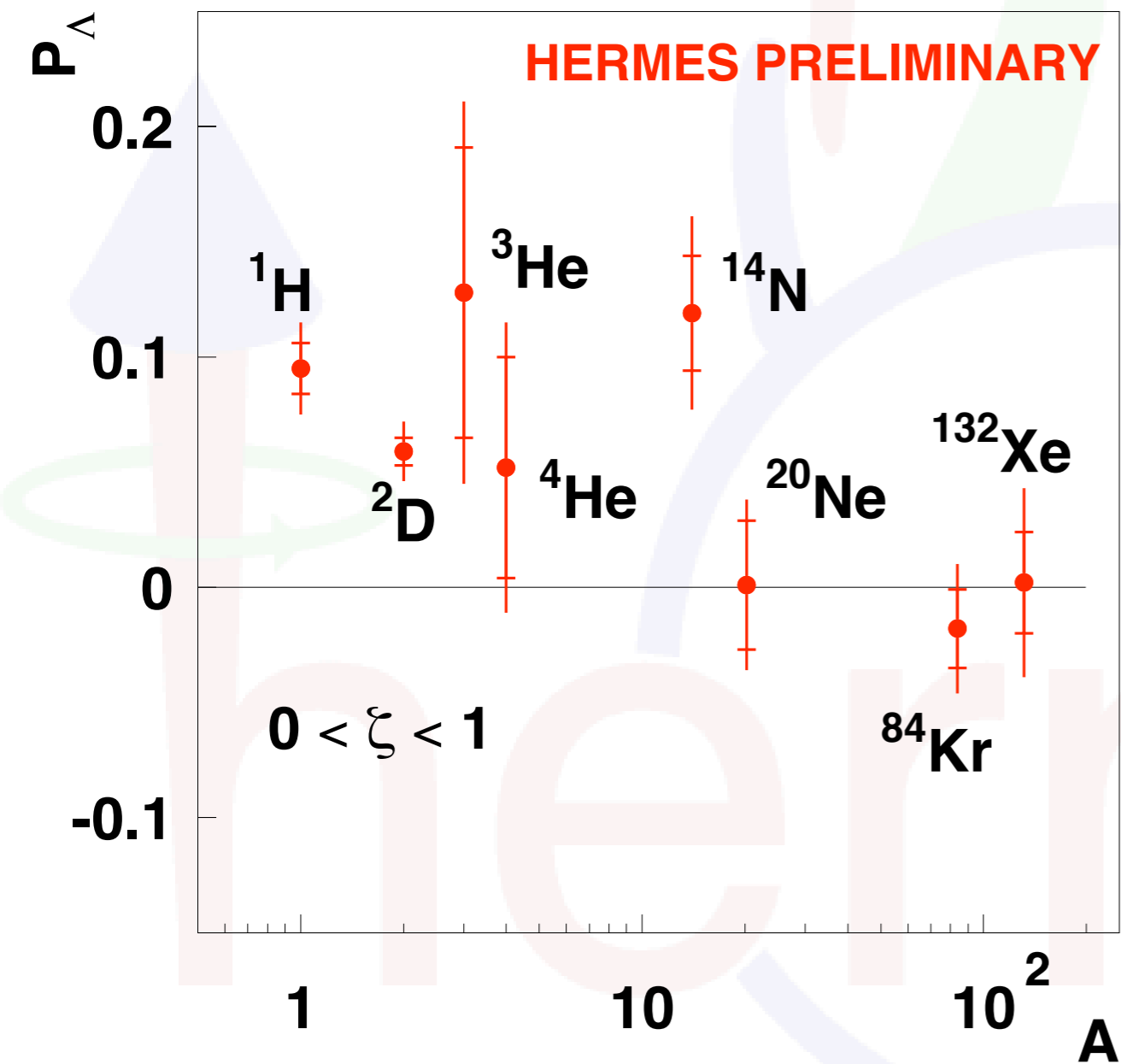
**GPDs
“Nucleon Tomography”**

*Strange-Baryon
Production*

*Exclusive Meson
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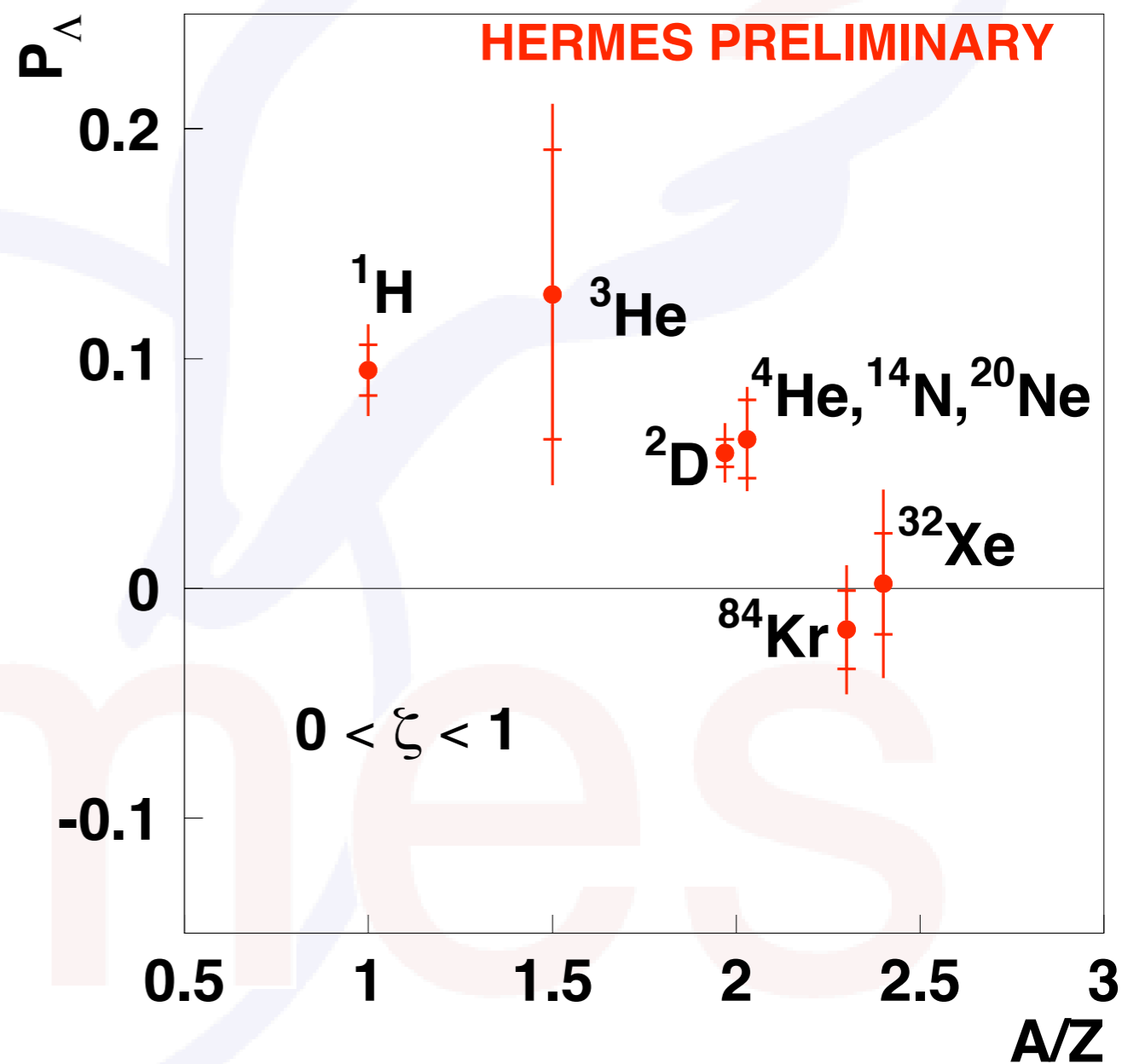
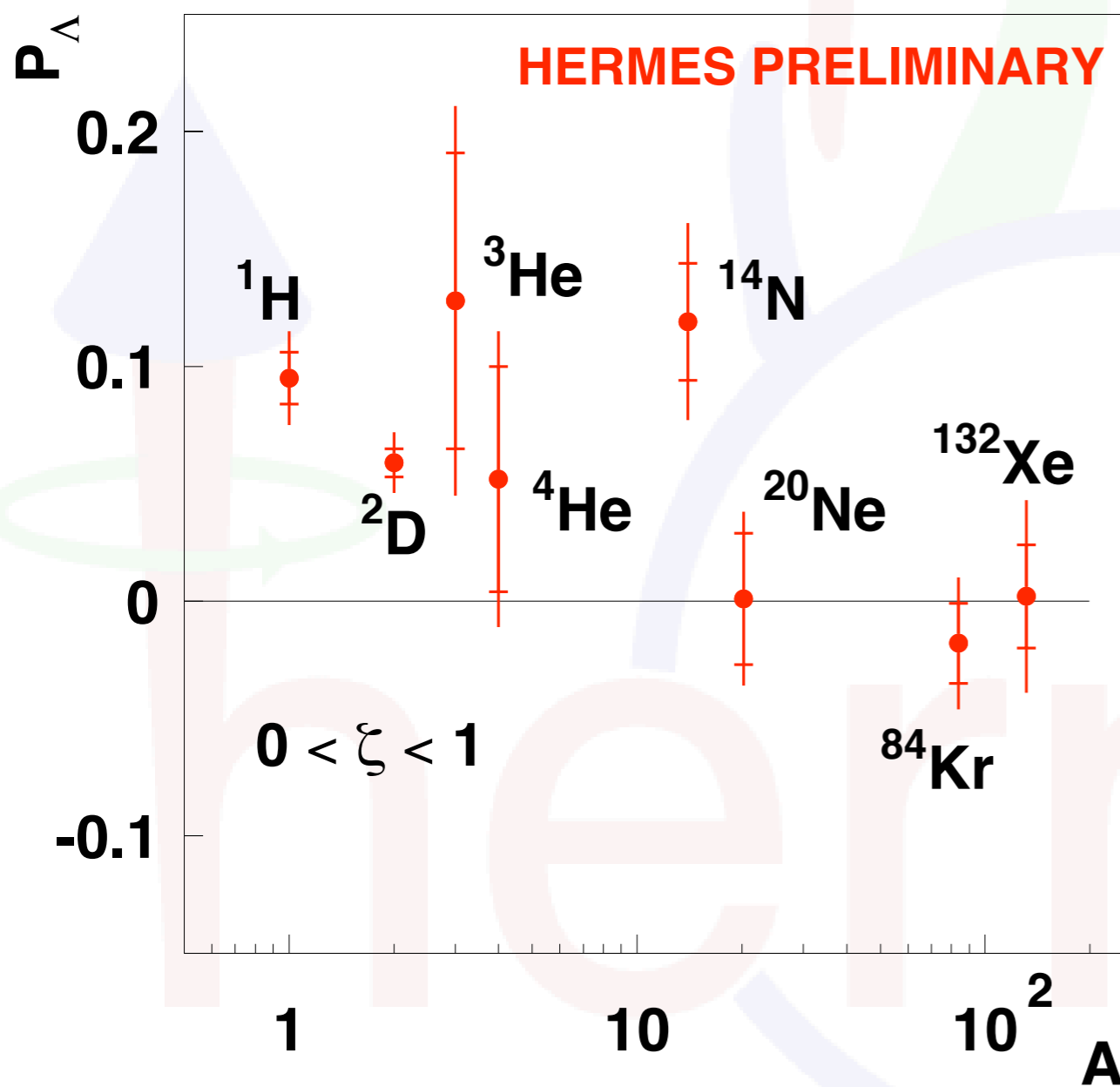
HERMES Physics Highlights since last PRC Mtg.

- **A-dependence of transverse Λ^0 polarization in $e N \rightarrow \Lambda^0 X$:**



HERMES Physics Highlights since last PRC Mtg.

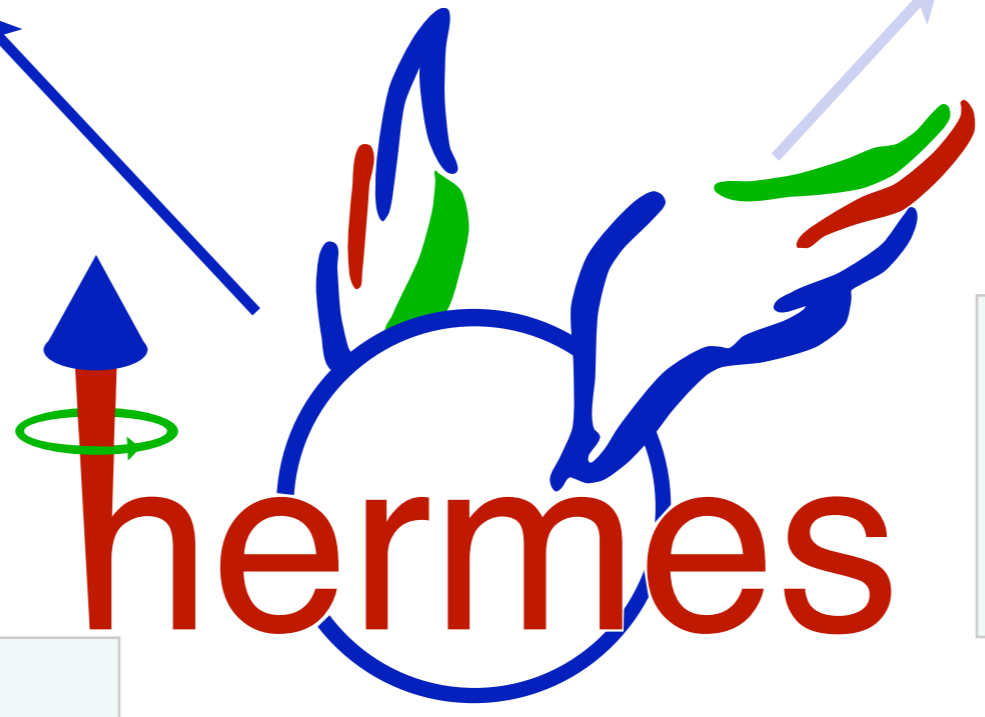
- **A-dependence of transverse Λ^0 polarization in $e N \rightarrow \Lambda^0 X$:**



*Longitudinal Spin/
Momentum Structure,
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DVCS



hermes

**Transversity
TMDs**

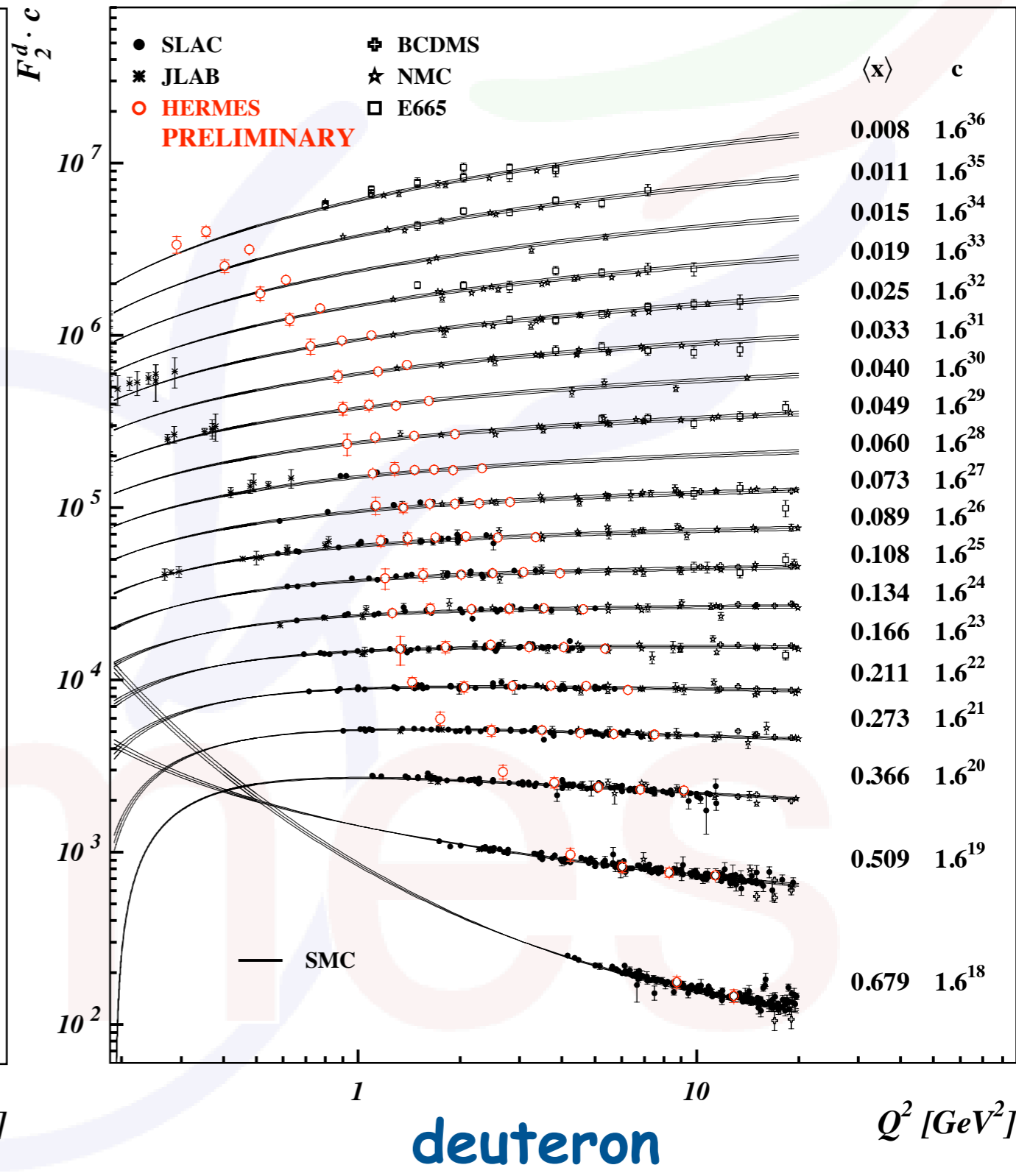
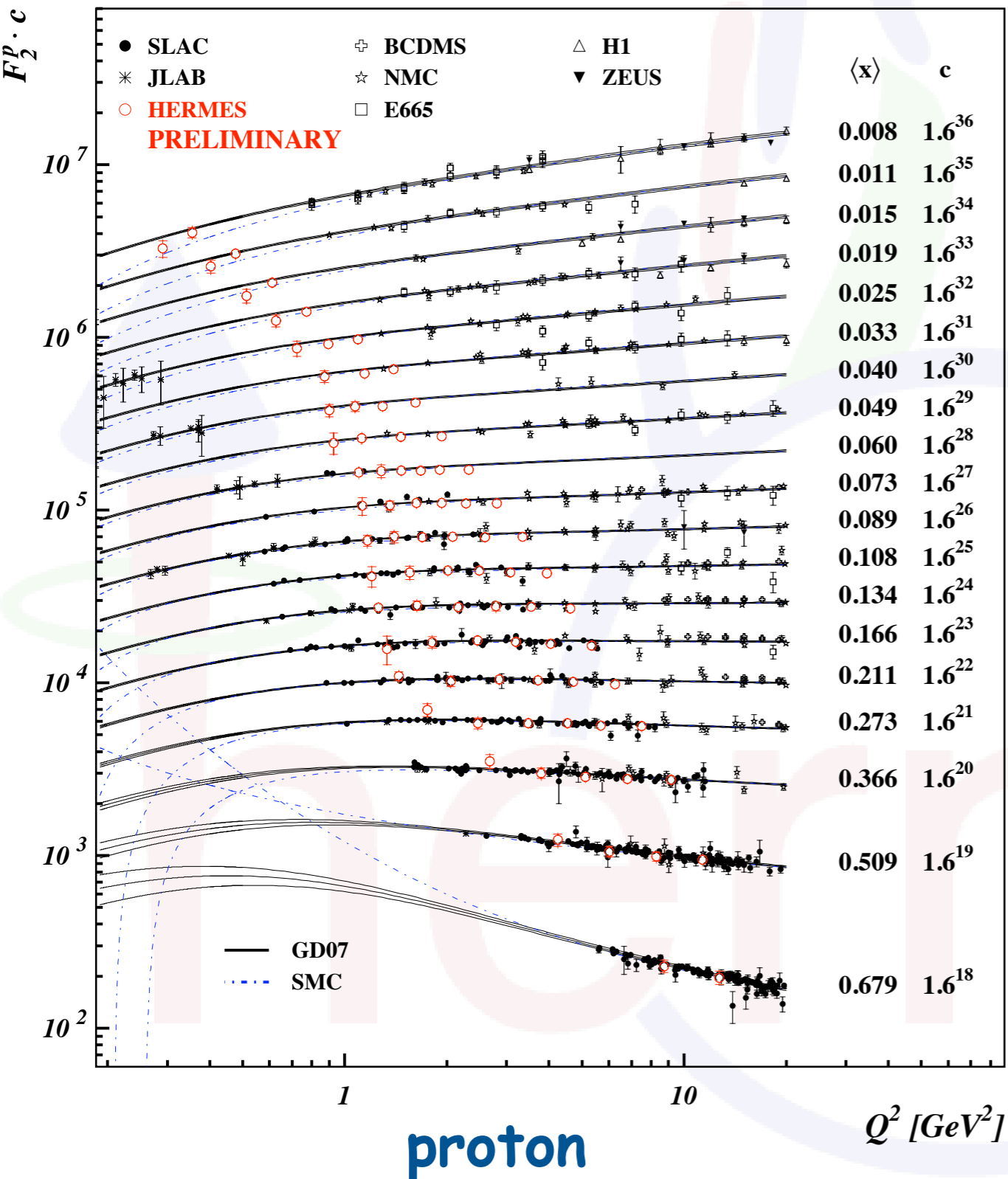
**GPDs
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*Exclusive Meson
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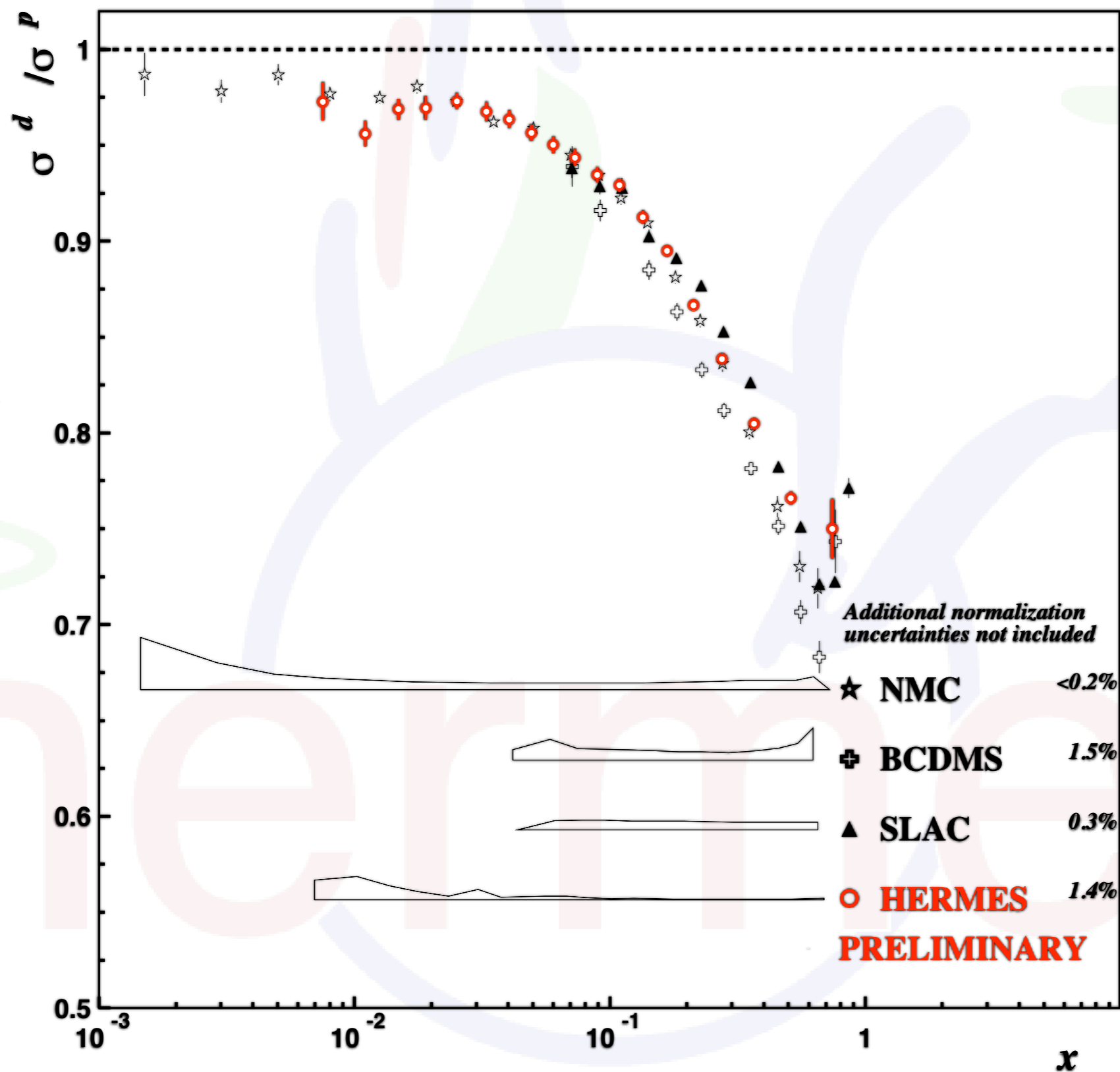
HERMES Physics Highlights since last PRC Mtg.

● F_2 structure function off H and D targets:



HERMES Physics Highlights since last PRC Mtg.

● F_2 structure function off H and D targets:



Publications & Physics Analyses

- **1 paper accepted**
- **8 paper drafts in circulation stage**
- **12 paper drafts in preparation stage**

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 - **around 15 important analyses**
 - **around 10 interesting analyses looked into**

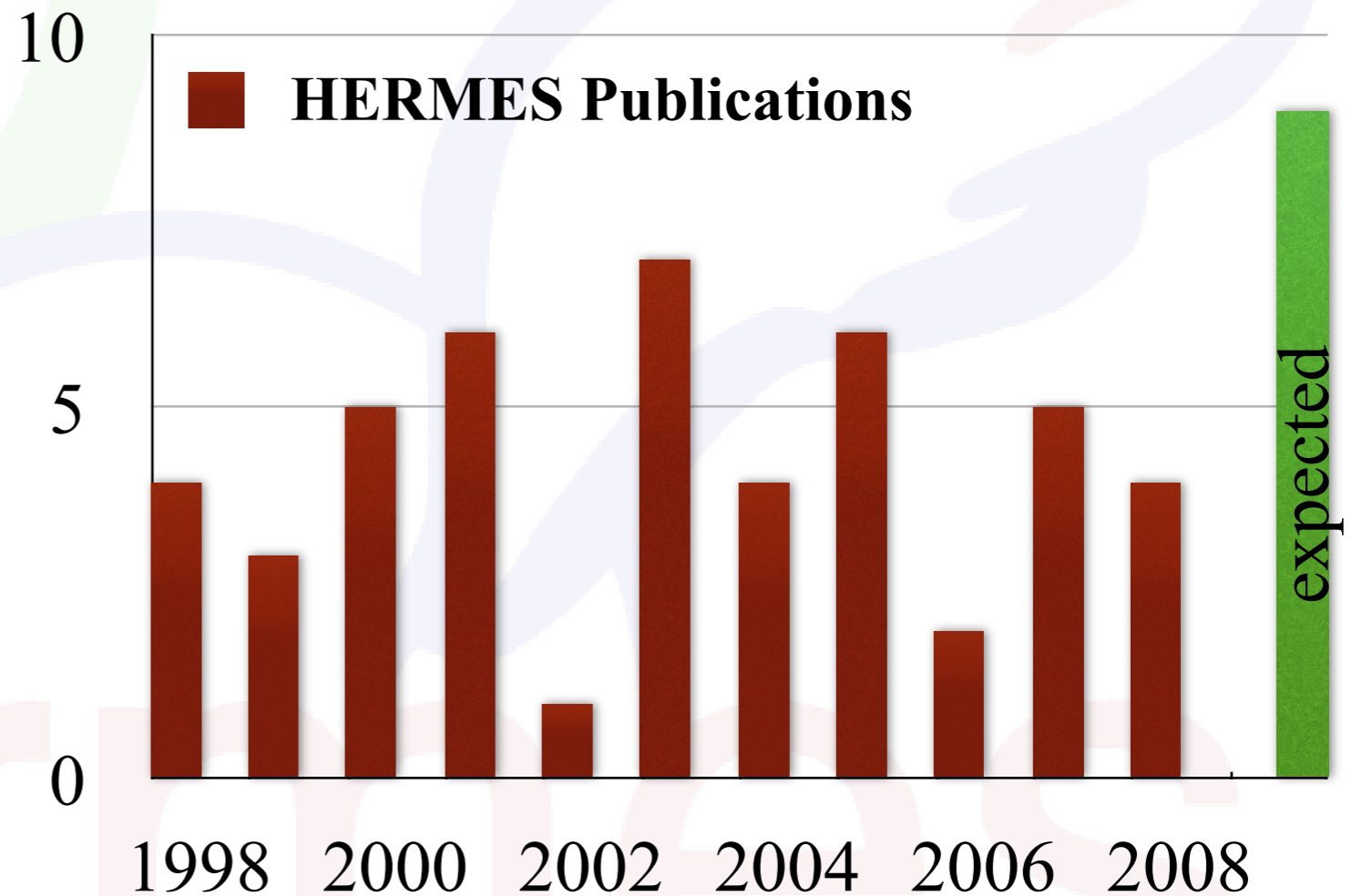
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“secured”
-
- The diagram features a large, faint watermark of a hand holding a globe in the background. On the right side, the text '~80% manpower "secured"' is written in red. Two red arrows originate from this text and point towards the 'around 25 key analyses' and 'around 15 important analyses' items in the list. Additionally, a green circular arrow is positioned to the left of the 'around 25 key analyses' item.

Publications & Presentations

Major conferences:

- 12 talks at **Spin 2008**
(3 invited talks)
- 11 talks at **DIS 2009**
- 10 talks at **ENPC 2009**



in average about 70 citations per paper

Progress on Recoil-Detector Analysis

- **calibrations silicon, SciFi, and photon detectors ... done**
- **particle identification ... (almost) done**
- **tracking ... done**
- **fine tuning (ghost-track suppression, etc.) ... in progress**
- **efficiencies ... in progress**
- **Monte Carlo ... (almost) done**
- **refinements:**
 - **calibration fine tuning, kinematic fitting, tracking with photon detector**

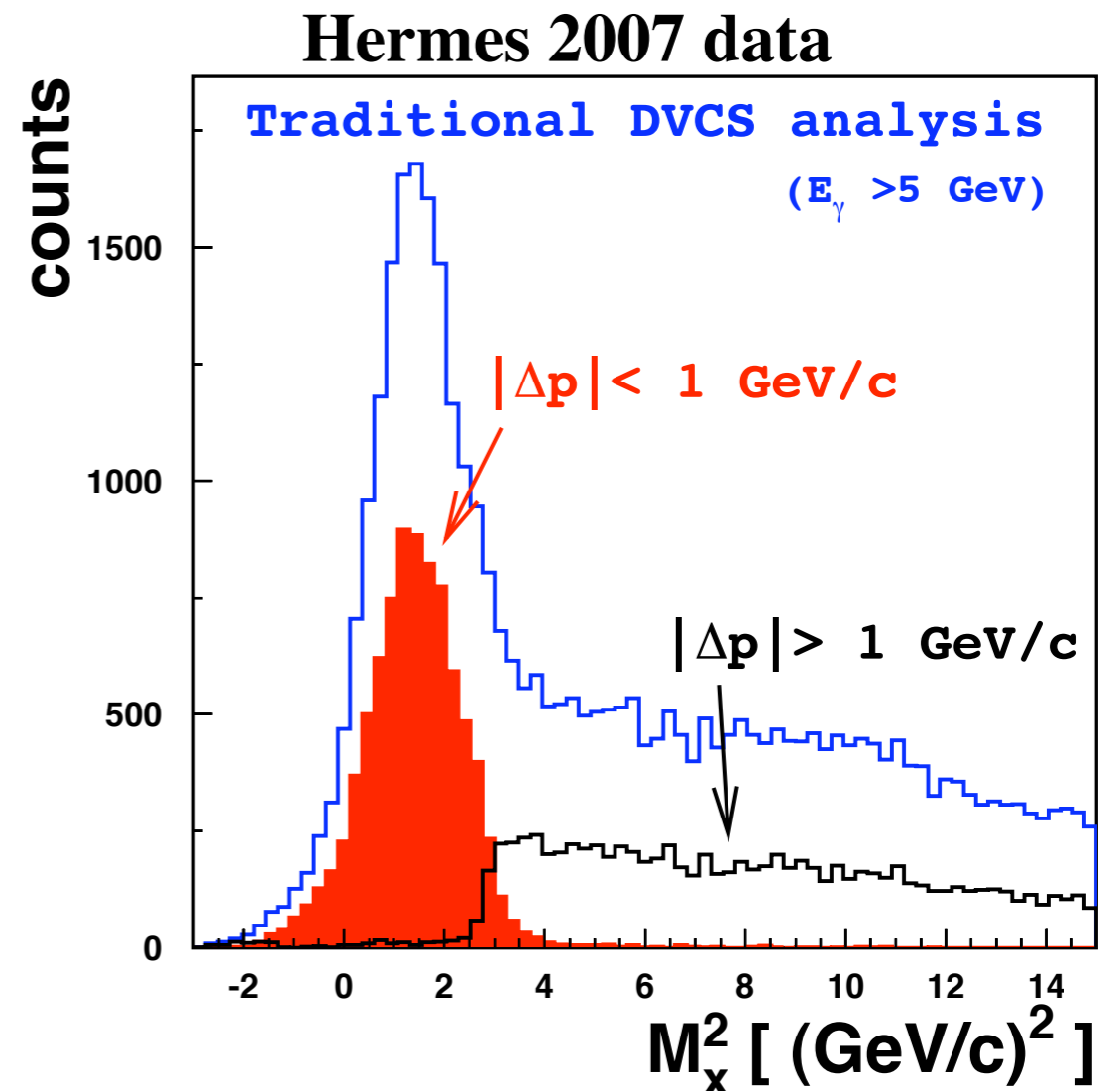
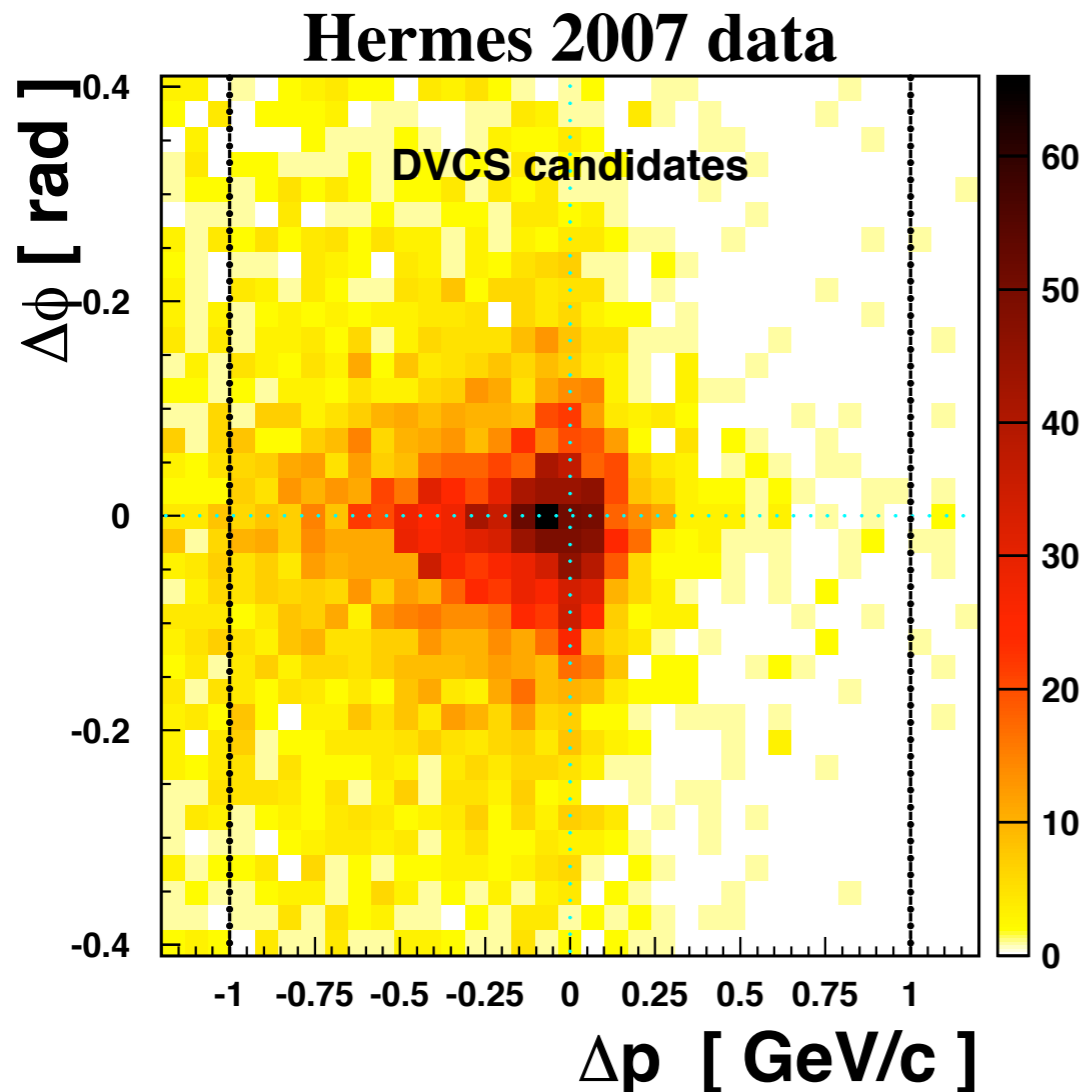
DVCS Event selection

measured with RD

inferred from forward spectrometer

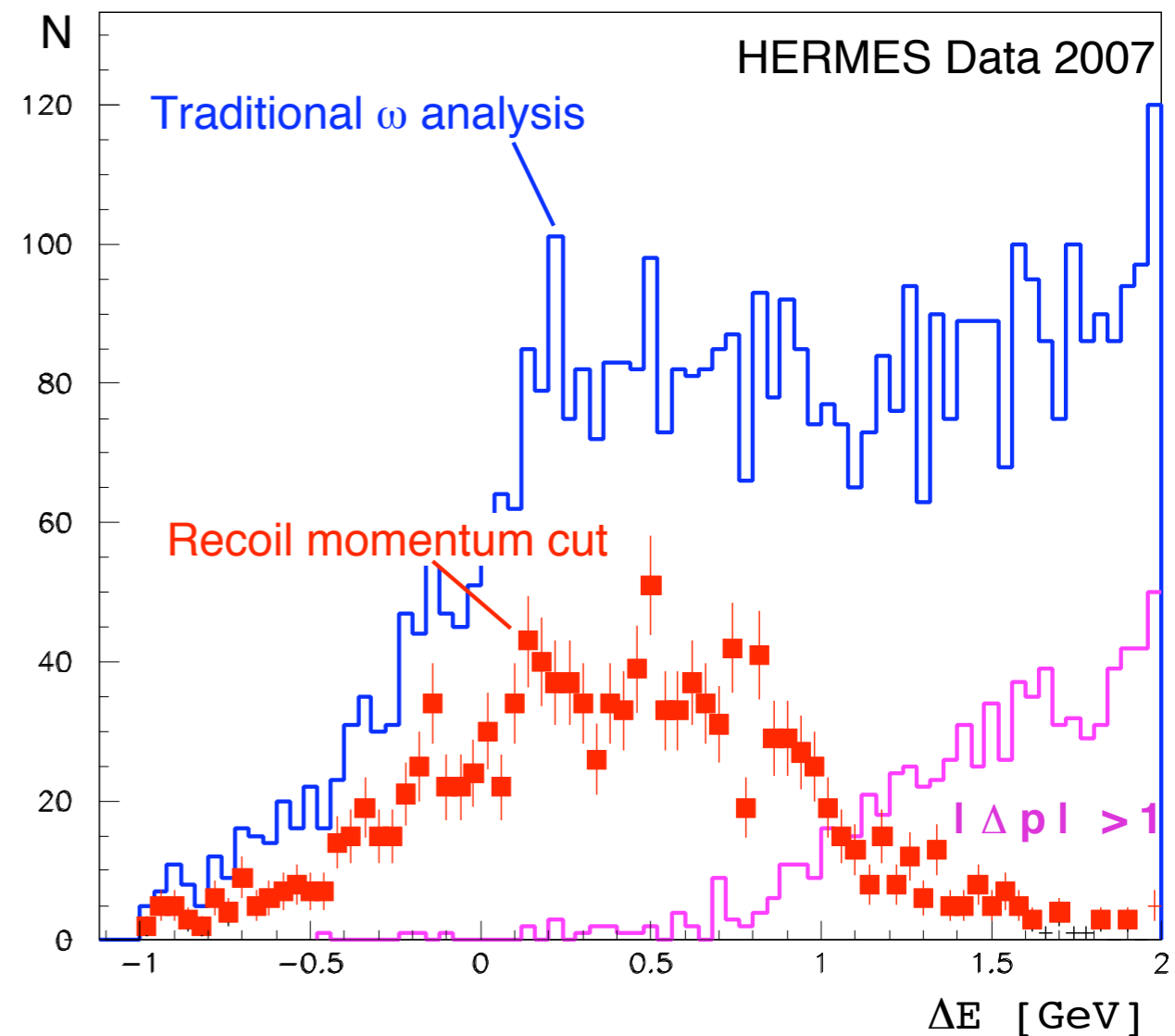
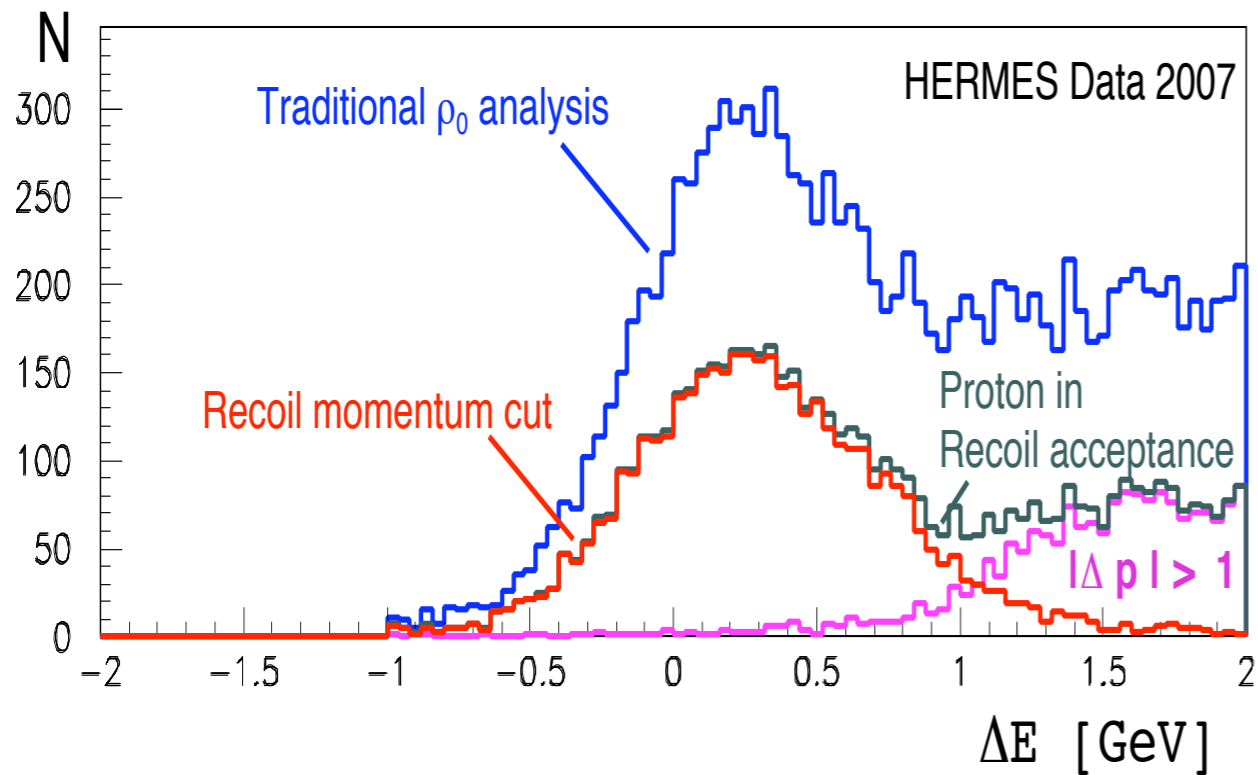
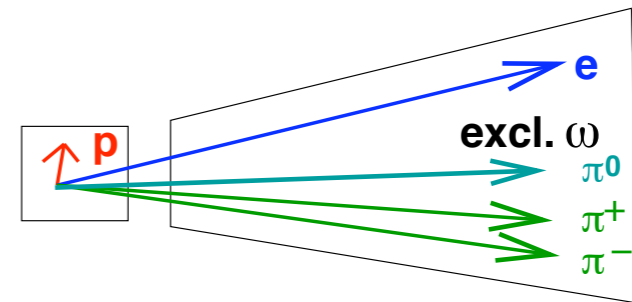
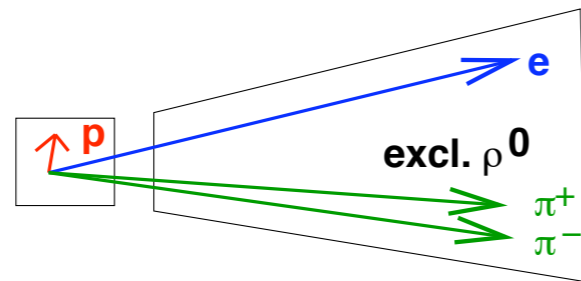
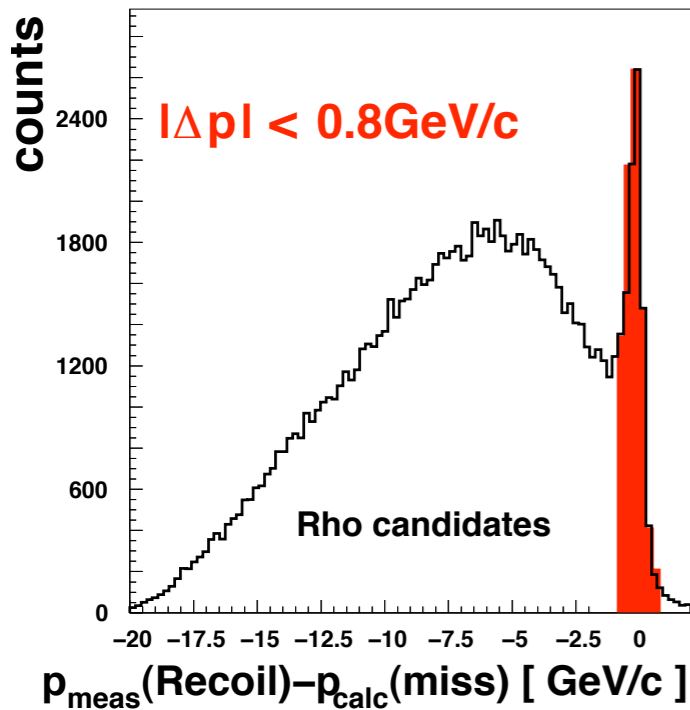
- ▶ Missing ϕ : $\Delta\phi = \phi_{\text{meas}} - \phi_{\text{calc}}$
- ▶ Missing p : $\Delta p = p_{\text{meas}} - p_{\text{calc}}$

Missing Mass ($\approx M_P^2$):
 $M_X^2 = (p + p_{\gamma^*} - p_{\gamma})^2$



Exclusive VM Event Selection

HERMES 2007 data



Data Processing

- **most of data productions foreseen to be done end of 2010**
 - **data until 2005 (“pre-Recoil”) by middle of 2009**
 - **2006/07 (“Recoil”) data still requires several iterations (fine tuning of calibrations, tracking etc.)**
 - ▮▮▮ **“physics production” ready Fall 2009**
 - ▮▮▮ **final productions expected to be finished end of 2010**
- **Monte Carlo productions running in parallel**
 - **with end of processing of experimental data, much increased computing power available on HERMES PC farm**
 - **in the meanwhile use of GRID when necessary**

Summary

- **five new results became available since last PRC and have been presented at the main conferences**
- **many more results expected to come**
- **first physics analyses using the recoil detector underway**

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