

Polarized ^3He in CLAS12

Exclusive Process Measurements

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Outline

- 1 Physics overview, model ingredients
- 2 Simulations status
 - Coherent channel
 - Incoherent channel
- 3 Summary outlook

Disclaimer: Very preliminary results, work just started



Exclusive physics overview

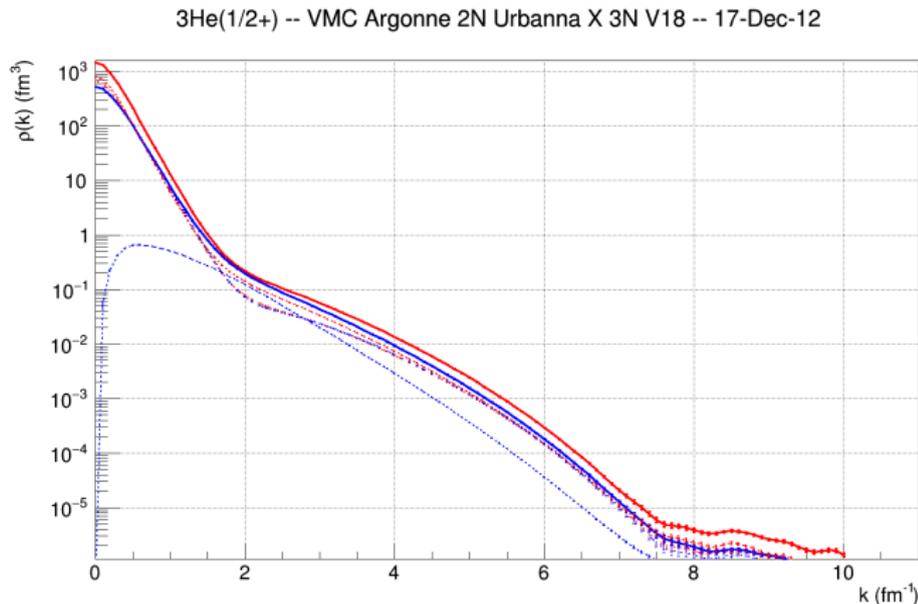
Current workforce: UConn group

Kyungseon Joo, Stefan Diehl, Andrey Kim, FXG

	Process	Sensitivity	
Coherent	$e^3\text{He} \rightarrow e^3\text{He}\gamma$	Nuclear partonic structure	
Incoherent	$e n \rightarrow e n\gamma$	GPD E	Ji's sum rule
Coherent	$e^3\text{He} \rightarrow e^3\text{He}\pi^0$	Transversity GPDs	DVCS background
Incoherent	$e n \rightarrow e n\pi^0$		
Incoherent	$e N \rightarrow e N\pi^{+/-}$	Valence quarks	Complementary
Incoherent	$e N \rightarrow e \Sigma^{+/-} K^{+/-}$		
Coherent	$e^3\text{He} \rightarrow e^3\text{He}\phi$	Nuclear	gluonic structure
Incoherent	$e n \rightarrow e n\phi$	Neutron	



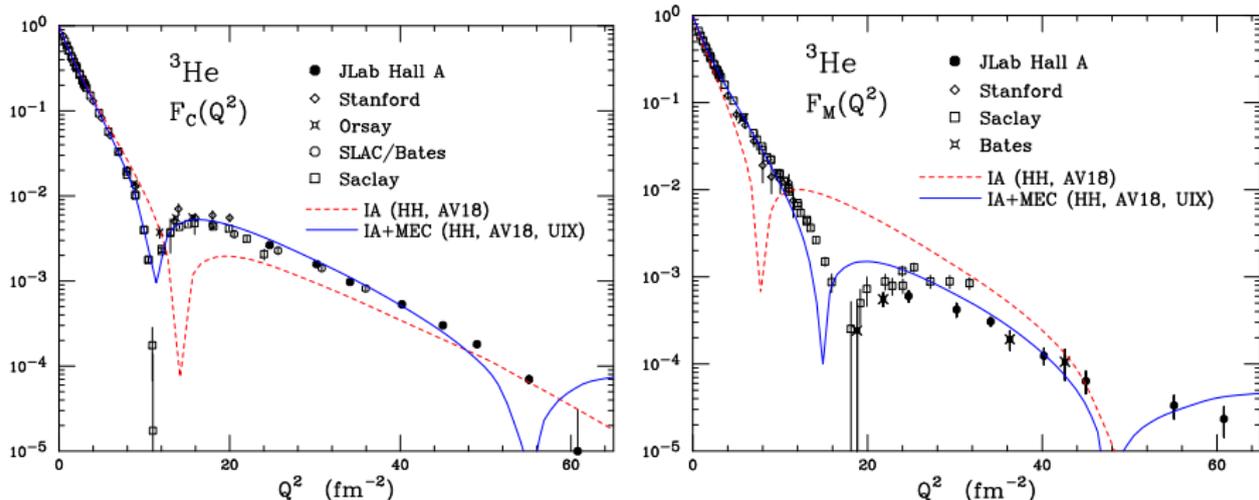
Input Fermi momentum



R. B. Wiringa *et al* Nucleon and nucleon-pair momentum distributions in $A < 12$ nuclei
Phys. Rev. C **89**, 024305 (2014)



Input charge and magnetic FFs



Hall A ^3He FFs measurement Phys. Rev. Lett. 119, 162501 (2017)

Coherent simulations

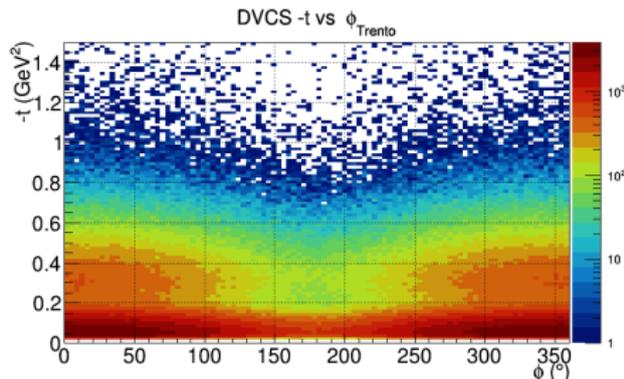
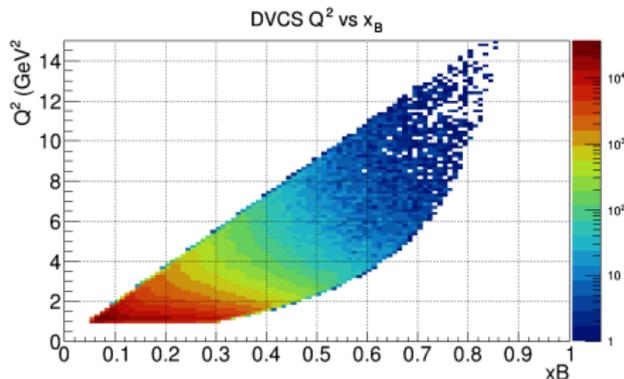
Generated kinematics

$Q^2 > 1 \text{ GeV}^2$, $x_B > 0.05$, $W > 1.8 \text{ GeV}$

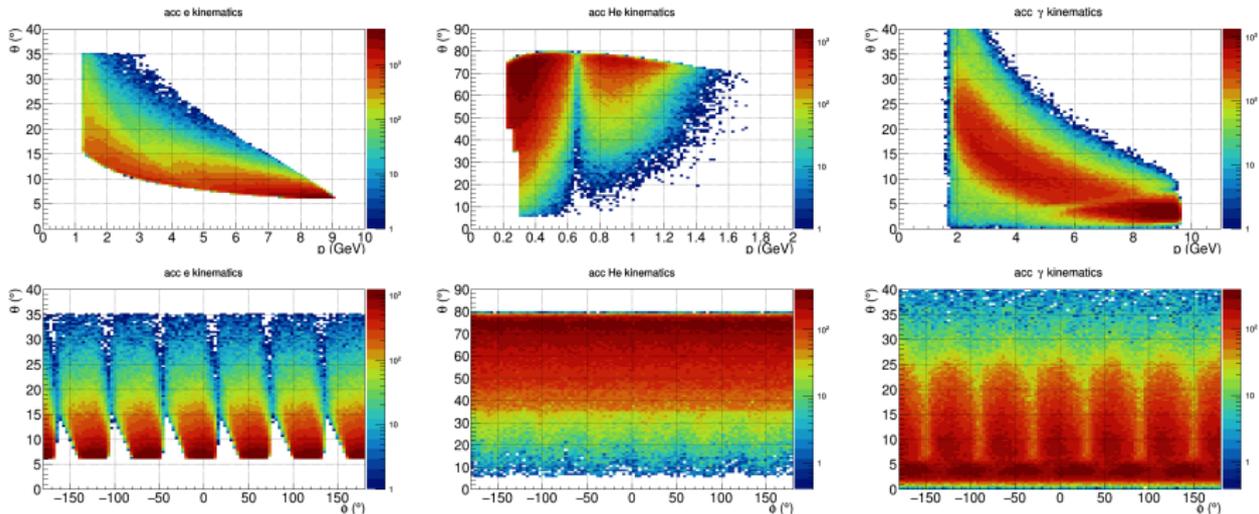
$\theta_e > 5^\circ$ and $E_e > 1.25 \text{ GeV}$

Note limited $-t$ range by nuclear FF

Node around $-t_A \approx 0.2 \text{ GeV}^2$



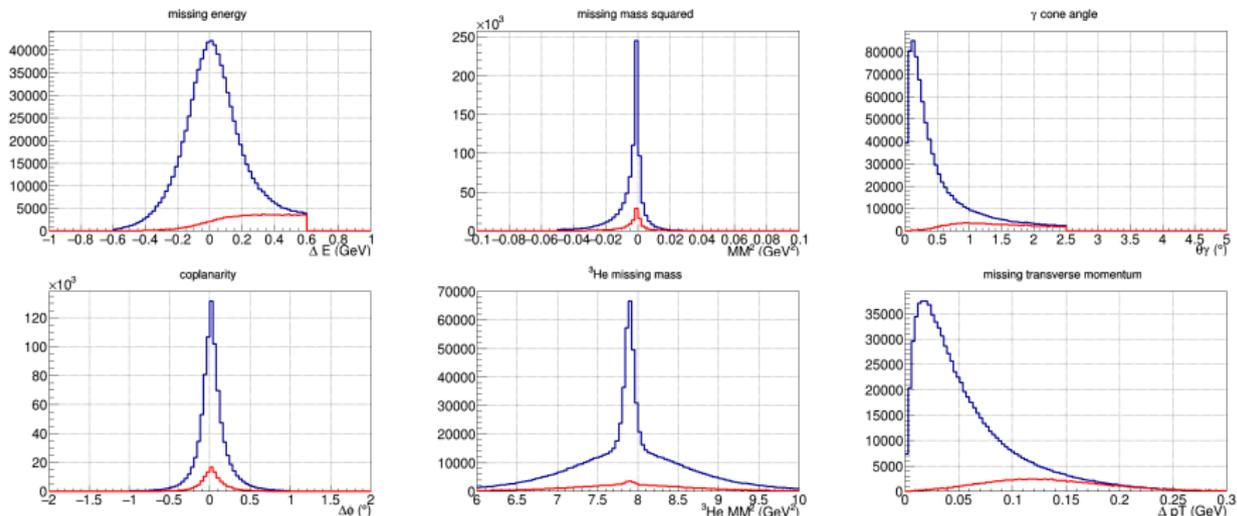
Coherent simulations



Accepted particle kinematics



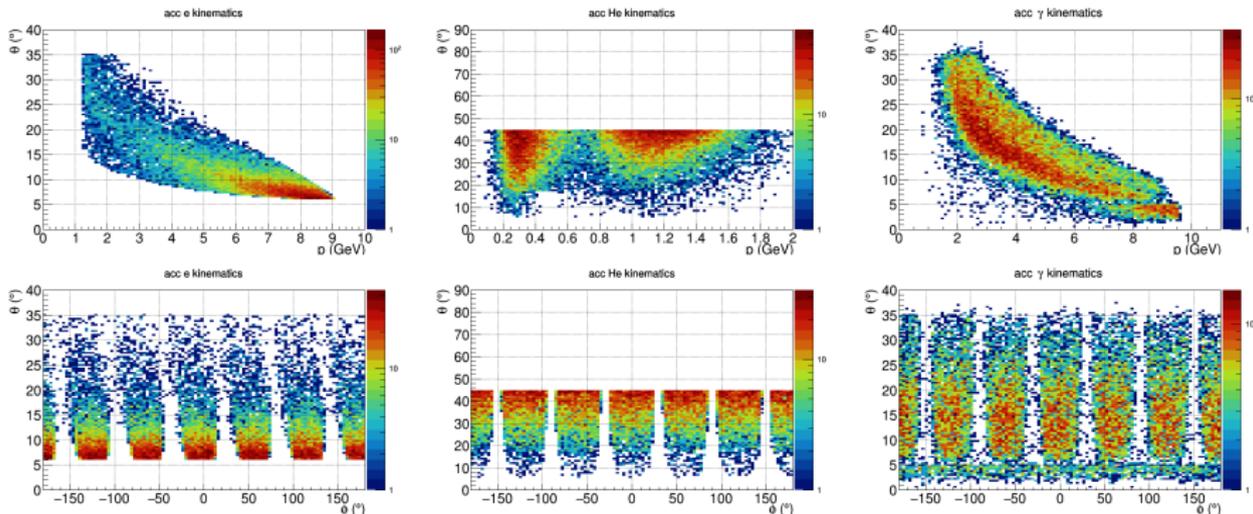
Coherent simulations



Very rough estimate of π^0 contamination



Incoherent simulations

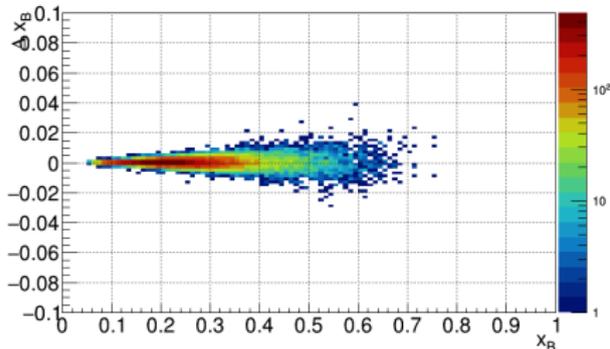


Simulations include $\approx 10\%$ efficiency
Need central neutron acceptance

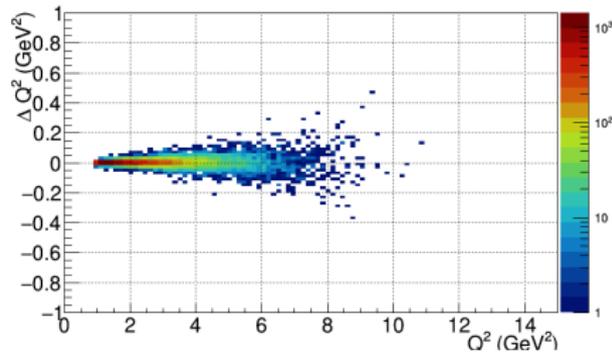


Incoherent simulations

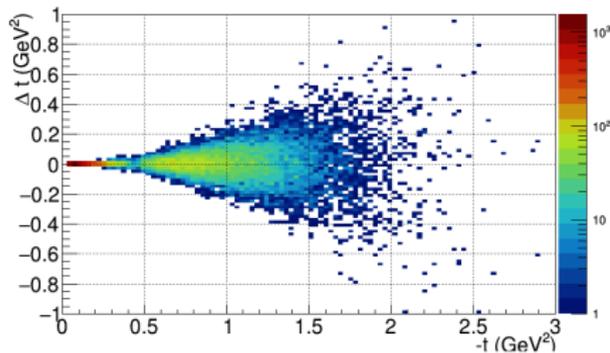
x_B resolution vs x_B



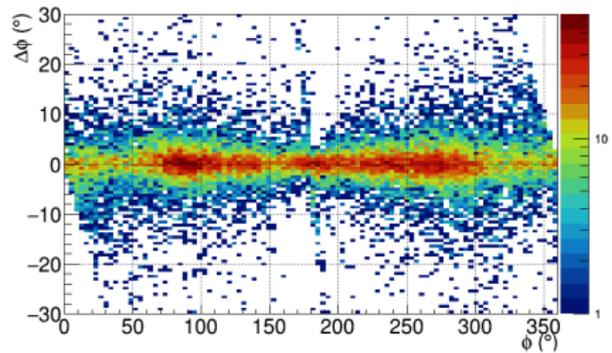
Q^2 resolution vs Q^2



$-t$ resolution vs $-t$



ϕ resolution vs ϕ



Summary outlook

- Exclusive reactions group proposal on polarized ^3He target
- Rich physics with many channels

- Work just started, preliminary results
- No show stopper foreseen

- Nexts steps: absolute rate projections
- Polarized observables and sensitivities to GPDs

Lots of work ahead but exciting dataset!

