CLAS12 Run Group B

Electroproduction on deuterium with CLAS12

- RG experiments
- Spring run overview
- Data processing status
- Performance of neutron detectors (CND, BAND)
- First results shown at DNP (nDVCS, dDVCS)
- Plans for fall/winter run

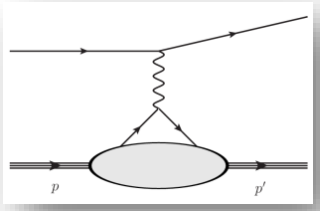
CEBAF Large Acceptance Spectrometer

Silvia Niccolai, IPN Orsay, on behalf of RG-B

CLAS Collaboration meeting, JLab, 11/13/2019

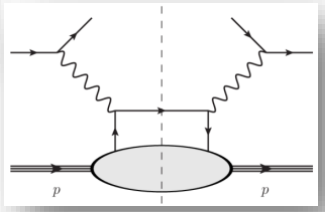
INSTITUT DE PHYSIQUE NUCLÉAIRE ORSAY

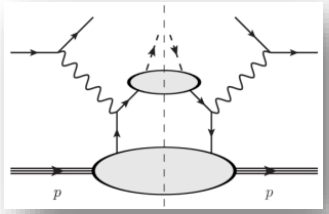
CLAS12 Run Group B: experiments



Elastic Scattering

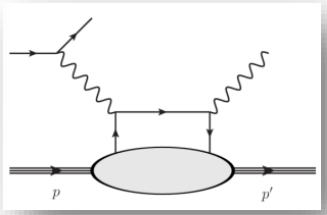
DIS (for SRC and EMC effect)

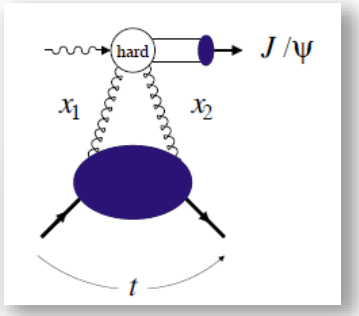




SIDIS

nDVCS





J/ψ photoproduction

E12-07-104	Neutron magnetic form factor	G. Gilfoyle	A-	30
E12-09-007a	Study of parton distributions in K SIDIS	K. Hafidi→W. Armstrong	A-	56
E12-09-008	Boer-Mulders asymmetry in K SIDIS	M. Contalbrigo	A-	56
E12-11-003	Deeply virtual Compton scattering on the neutron	S. Niccolai	A **(HI)**	90
E12-09-008b	Collinear nucleon structure at twist-3 in dihadron SIDIS	S. Pisano→M. Mirazita	--	
E12-11-003a	In medium structure functions, SRC, and the EMC effect	O. Hen	--	
E12-11-003b	Study of J/ψ photoproduction off the deuteron	Y. Ilieva	--	
E12-11-003c	Quasi-real photoproduction on deuterium	F. Hauenstein	--	

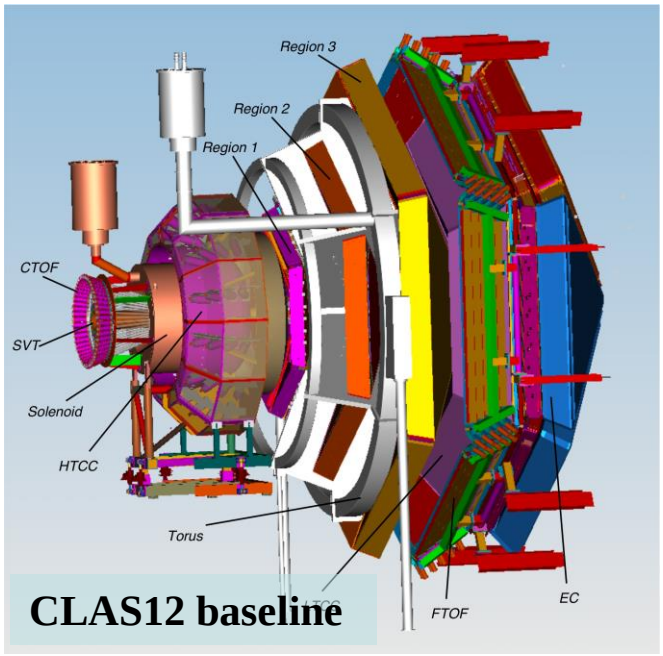
Common features to all experiments of RG-B:

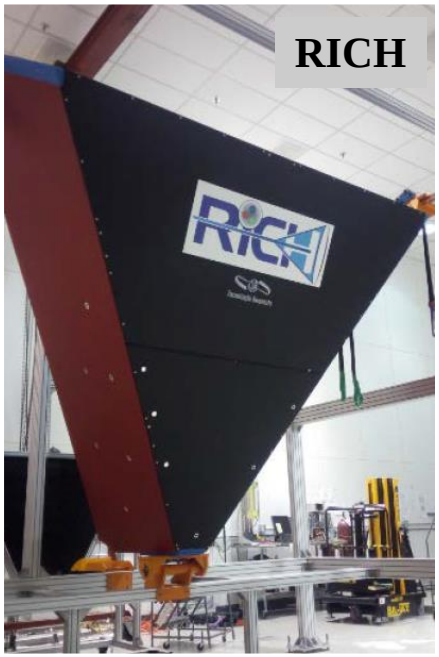
- **Liquid deuterium target**
- **Beam energy: « 11 » GeV**

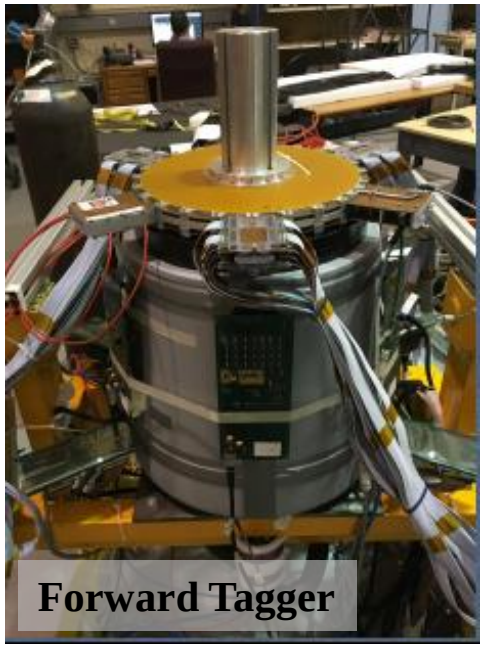
2019/2020 schedule:

- **spring (2/8/19 – 3/19/19)**
- **fall/winter (11/25/19 – 12/19/19 + 1/8/20-1/29/20)**

Run group B: experimental setup



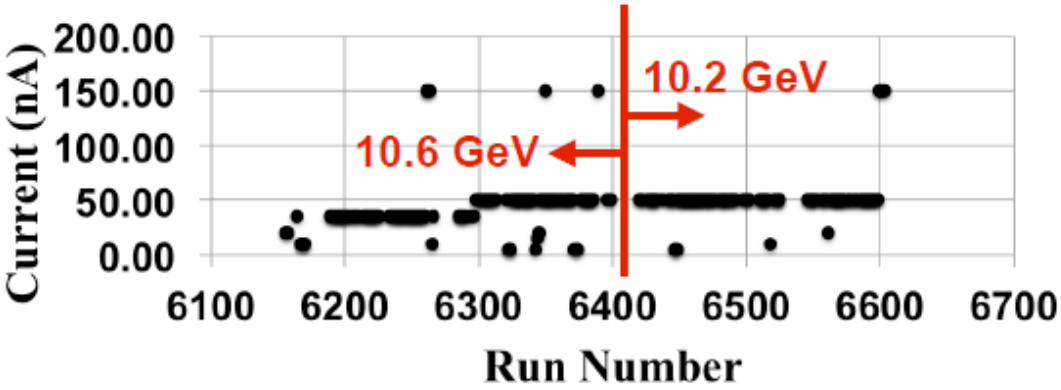


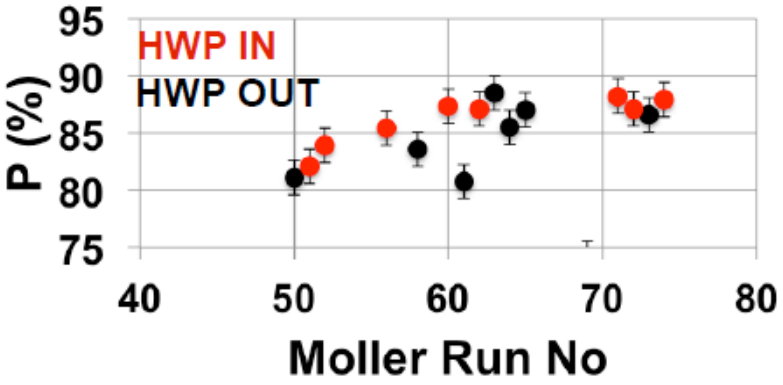


Run Group B spring: running conditions and statistics

Running conditions:

- Liquid deuterium target
- Same target cell as RGA (L=5 cm)
- Target position at z ~ -3 cm
- Beam energy: 10.6 GeV, 10.2 GeV
- Torus field: inbending
- FT-ON configuration
- 2 sectors with LTCC: 3 and 5
- RICH in sector 4
- Trigger: same as RGA but without FT
  - ✓ electron trigger
  - ✓ 2 muons opposite sectors
- At 50 nA, trigger rate ~14 kHz
- Production beam current: 50 nA (~25% less than necessary for L=10^{35} cm^2/s)





Statistics for the spring run:

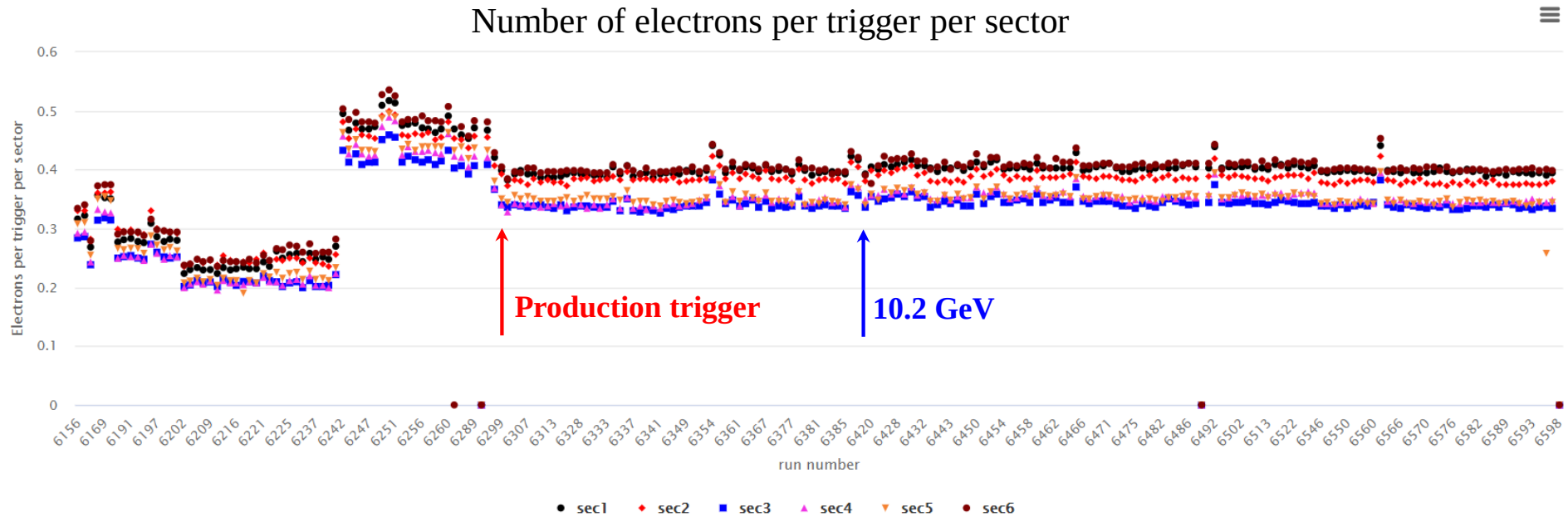
- 237 « good » production runs
- 10 empty target runs
- 13 low current runs
- ~9.7 B triggers at 10.6 GeV, 11.7 B at 10.2 GeV
- Average beam polarization ~86% (22 Moeller runs)
- ~21.8 PAC days → ~24% of the approved beam time

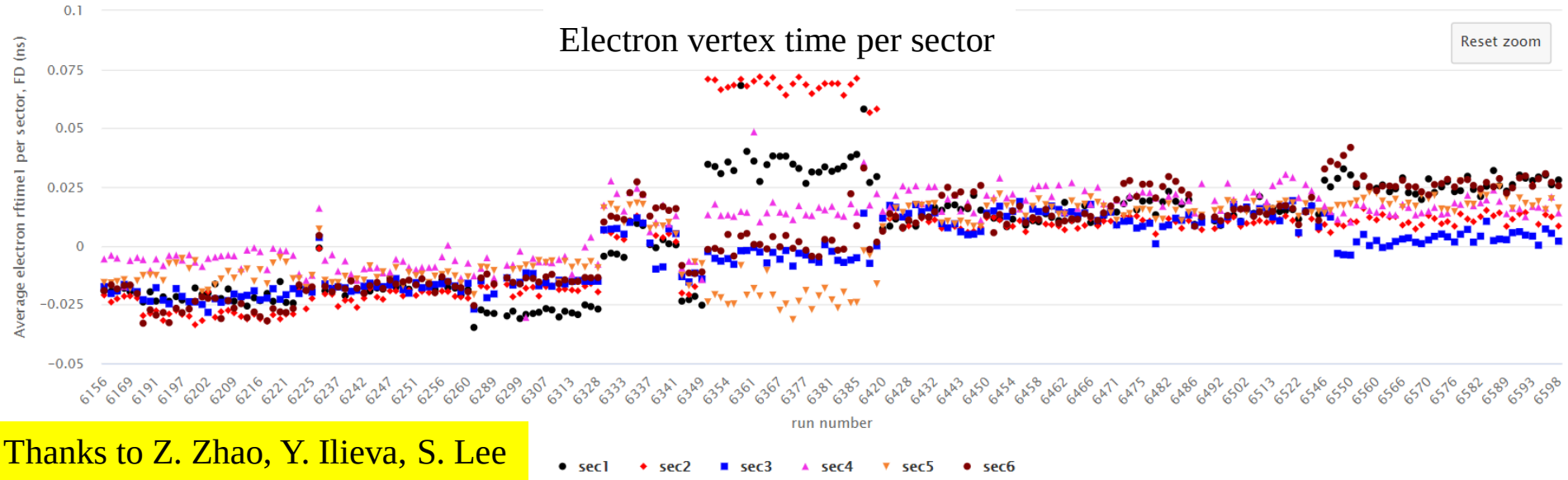
RG-B spring: data and calibrations quality

rat electron

10 files/run pass: https://clas12mon.jlab.org/rgb/pass0/v15/tlsummary/

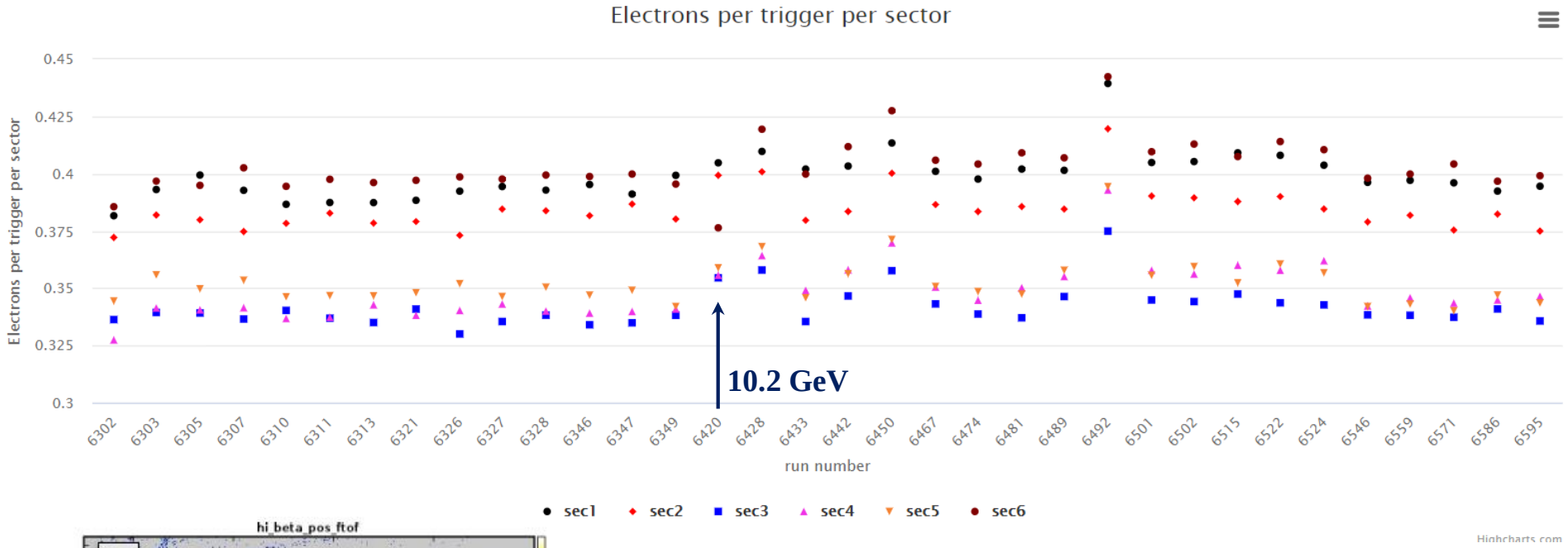
inbending vertical zoom

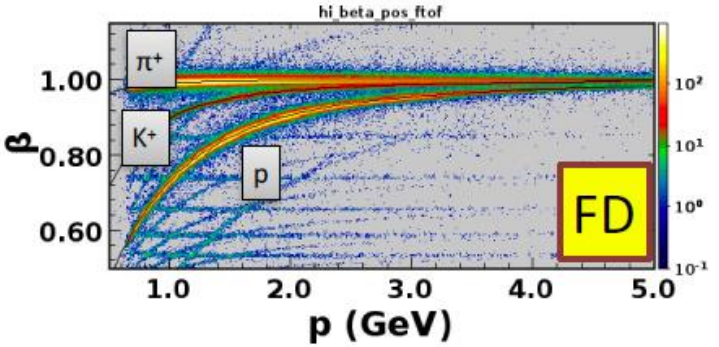


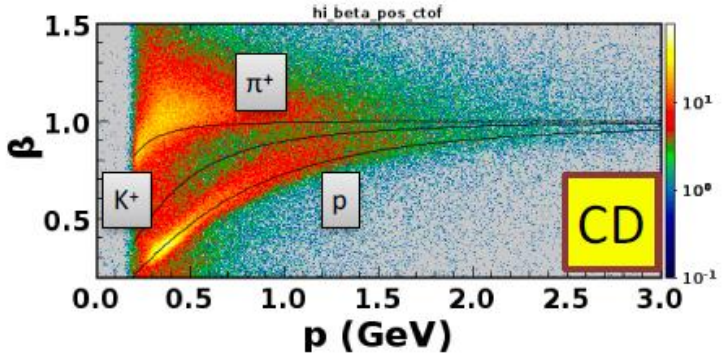


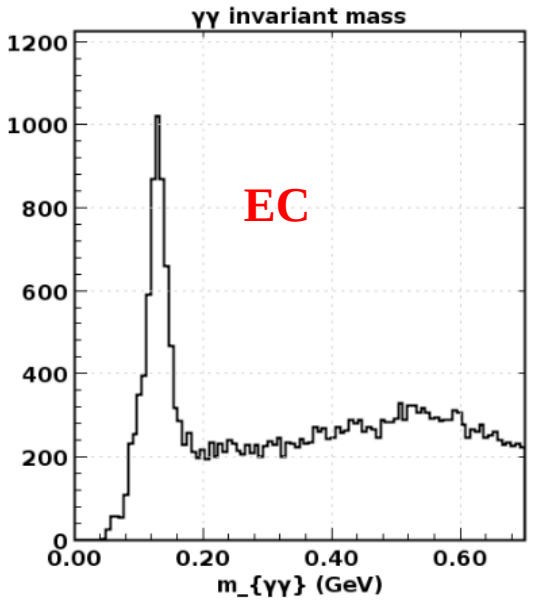
Thanks to Z. Zhao, Y. Ilieva, S. Lee

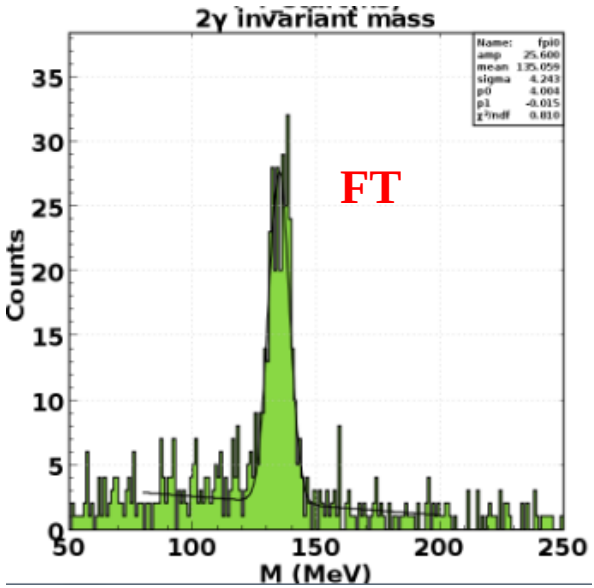
RG-B spring: 34 runs for DNP cooking



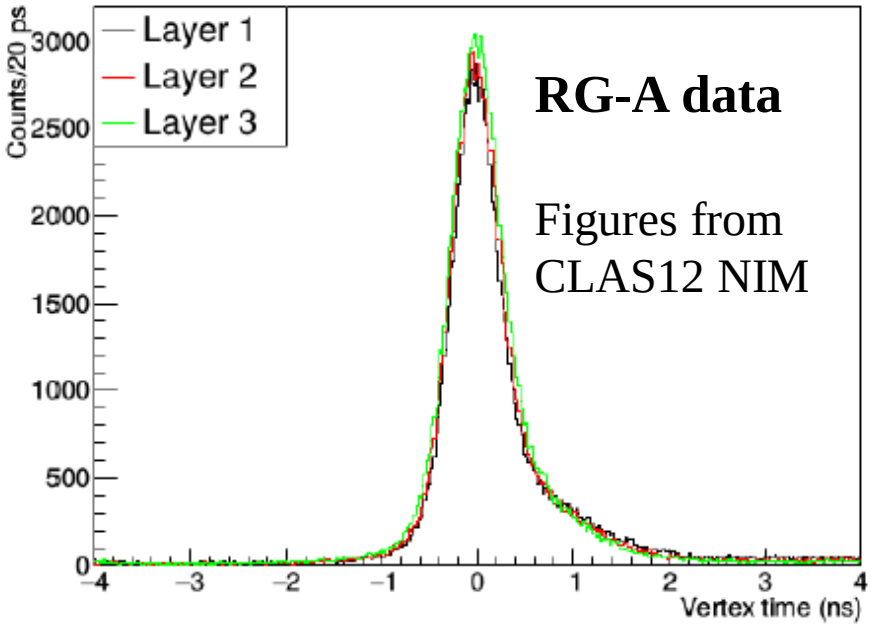


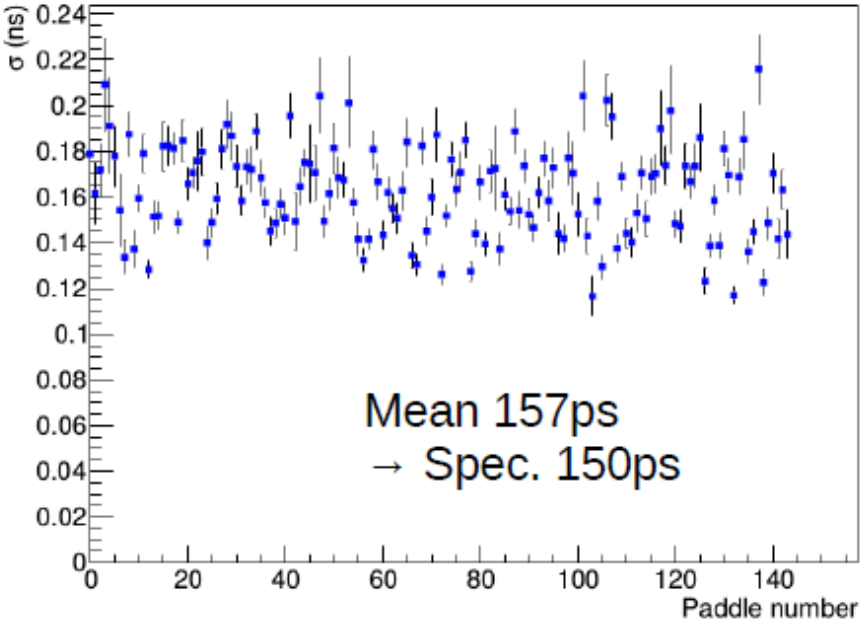


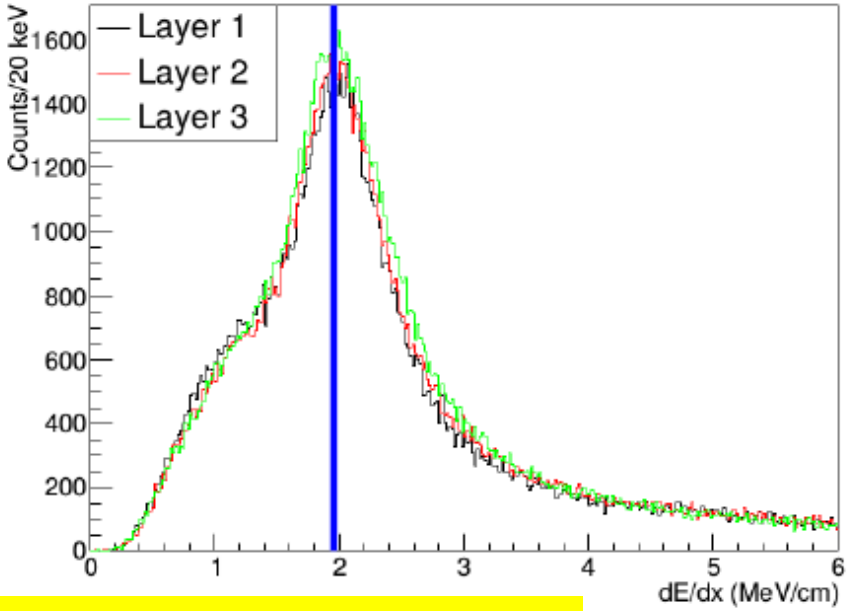


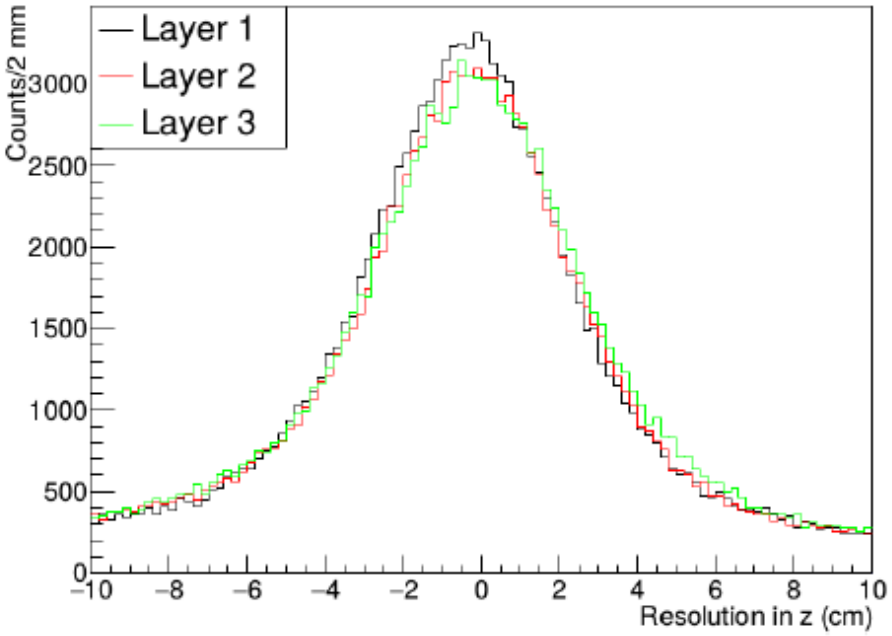


CND calibration quality and timing performances



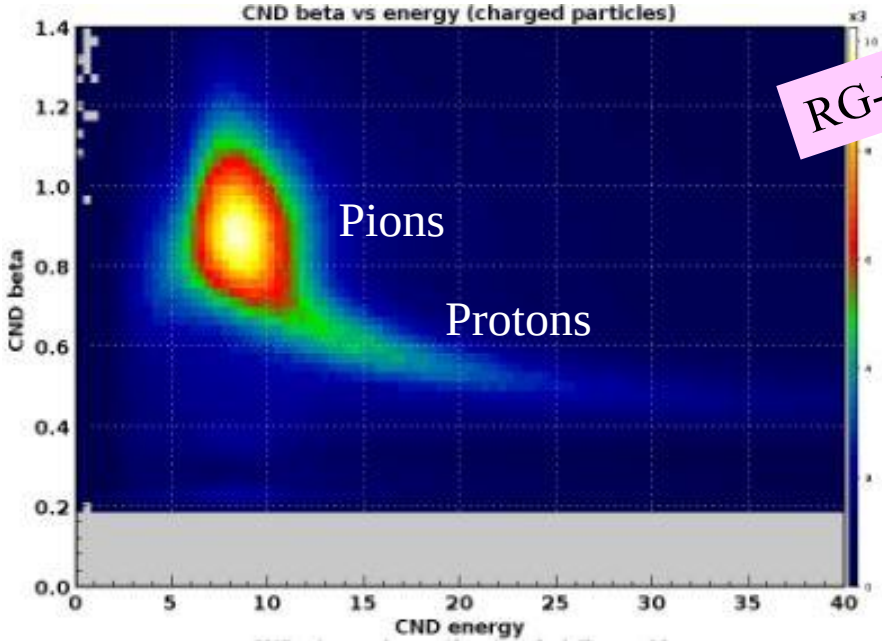




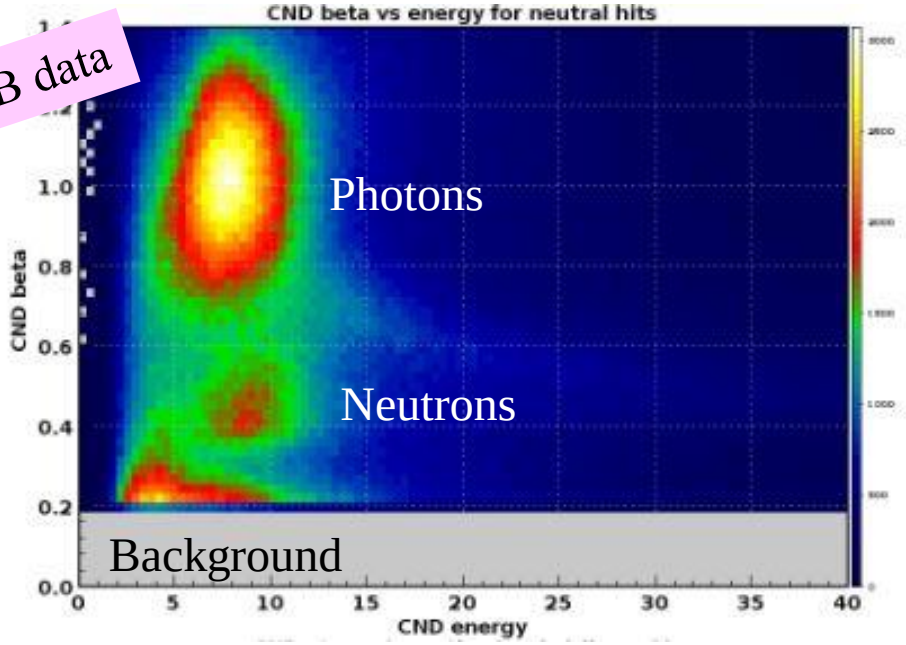


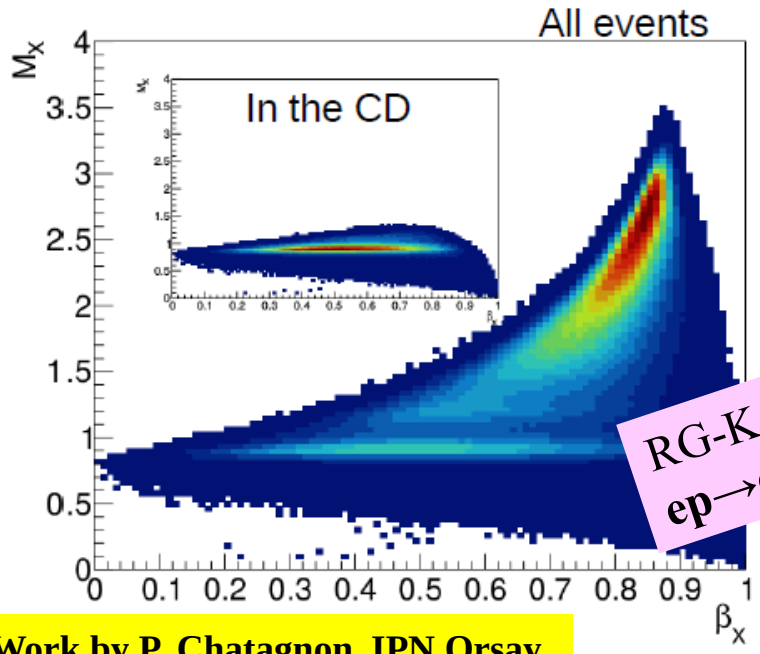
Work by P. Chatagnon, IPN Orsay

CND neutron detection efficiency

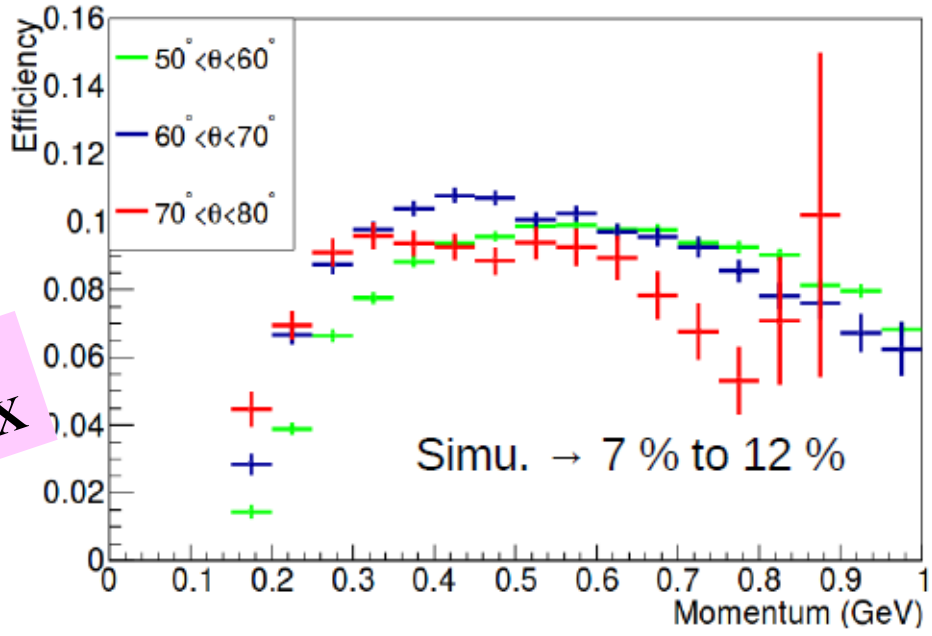


RG-B data



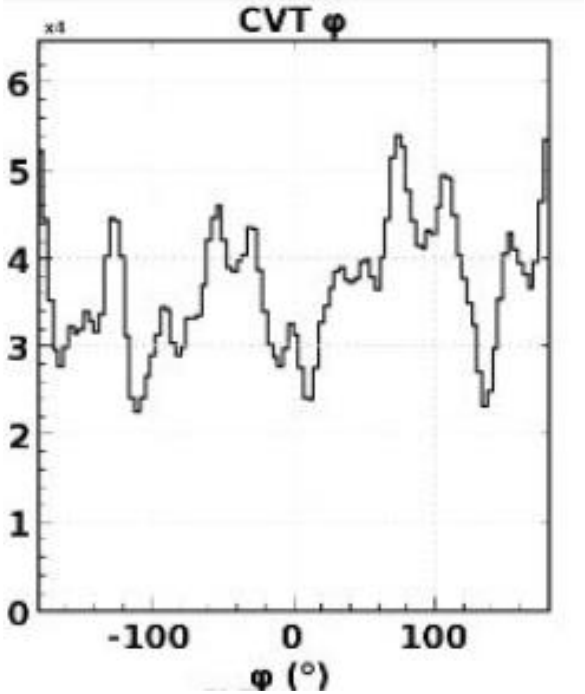


RG-K data
ep→e' π^+X



Work by P. Chatagnon, IPN Orsay

CND/CTOF charged particles veto

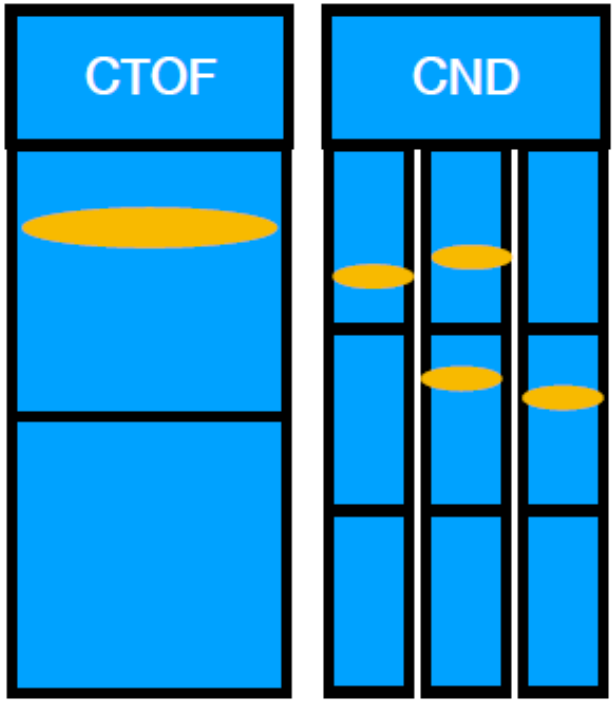


Problem:
CVT tracking efficiency not uniform nor 100% → charged particles contamination among « neutral » candidates

Solution:
CTOF/CND-based veto

Criteria:

- Minimize charged particles, maximize neutrons
- Use edep, position, and hit/layer multiplicity



- If an event was in CTOF only:
  - total energy for the event is < 18 MeV
- If an event was in CND and CTOF:
  - CND event energy is < 30 MeV, and CTOF event energy is < 10 MeV, and layer multiplicity is exactly 1
  - total event energy is < 10 MeV and layer multiplicity is exactly 2
- If an event was in CND only:
  - total event energy > 10 MeV and hit multiplicity is < 3
  - Total event energy ≤ 10 MeV and hit multiplicity is < 4

Implementation in COATJAVA almost complete:

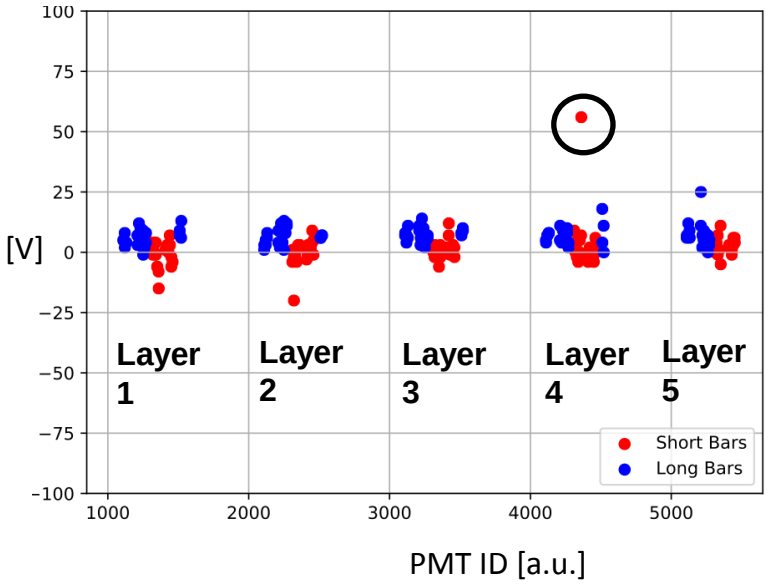
- new CND and CTOF clustering
- changes to EB

Plans for PID for charged…

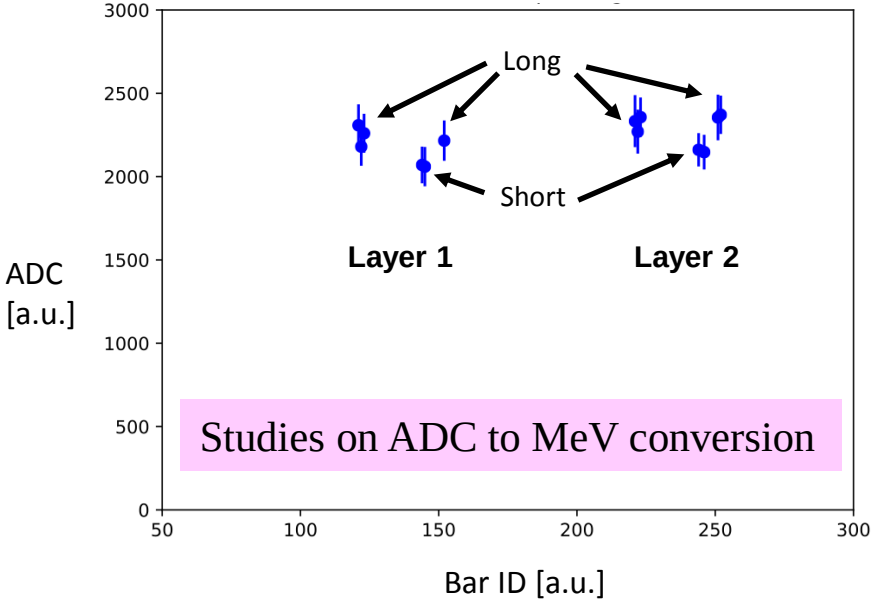
Work by K. Price and A. Hobart, IPN Orsay

Recommissioning of BAND

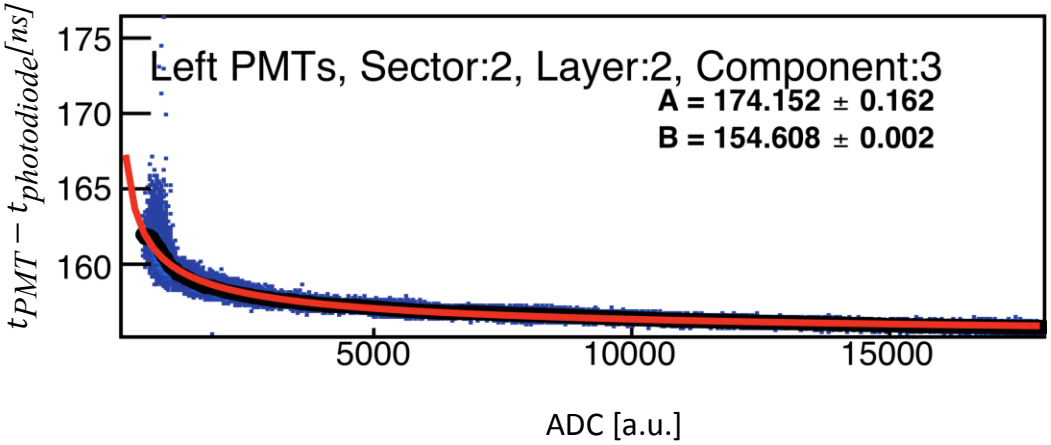
HV differential (spring-now)
from cosmics data



Compton Edge of Co-60 (~1 MeV)



Studies on ADC to MeV conversion

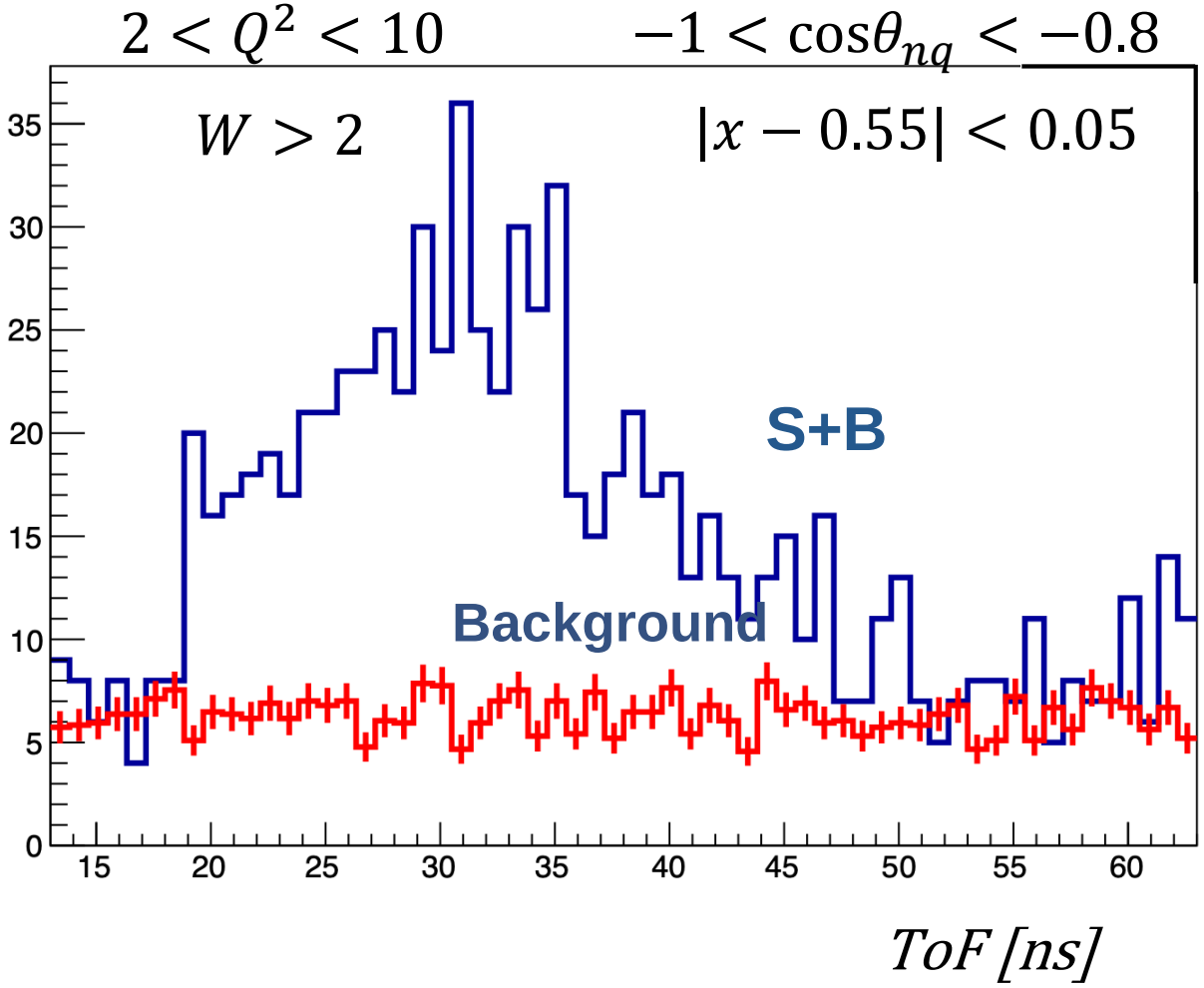


- Laser was reinstalled
- Time-walk curves taken for all PMTs

Work by E. Segarra *et al.* (MIT) and F. Hauenstein (ODU)

BAND analysis: high-x tagged DIS

Final results for tagged DIS will be: $N(Q^2, \text{hi-x'}, p_n, \theta_{nq}) / N(Q^2, \text{low-x'}, p_n, \theta_{nq})$



Data from DNP cooking ~3.5% of all RG-B data

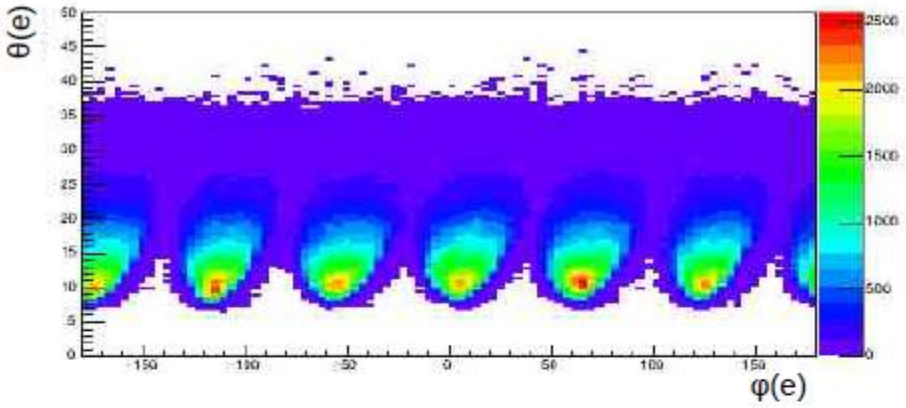
- **Good statistics** above background in the hi-x' region.
- Estimation of background level via event-mixing method.
- Work ongoing on simulations for acceptance corrections with GEMC

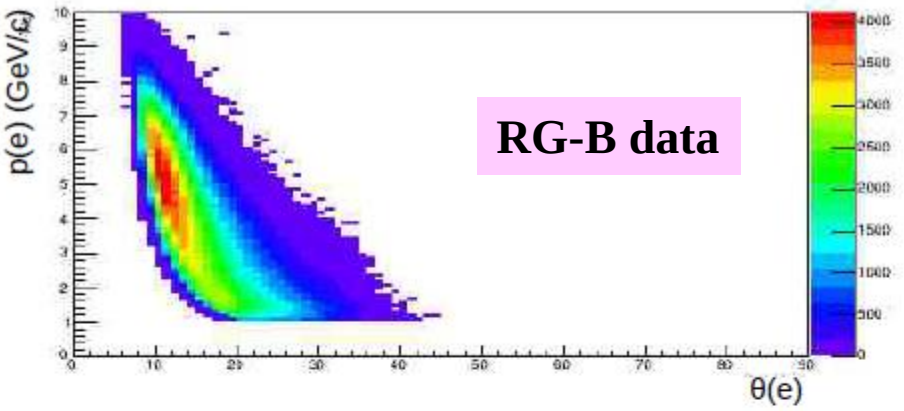
Work by E. Segarra *et al.* (MIT) and F. Hauenstein (ODU)

ed→enγ(p)

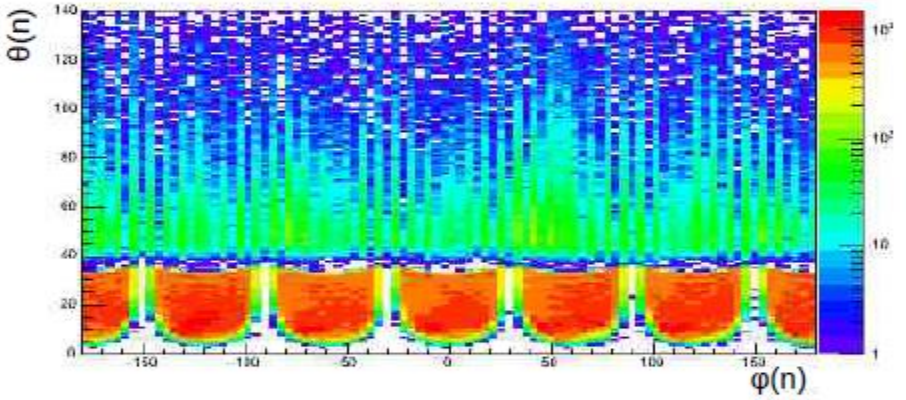
K. Price (DNP'19)

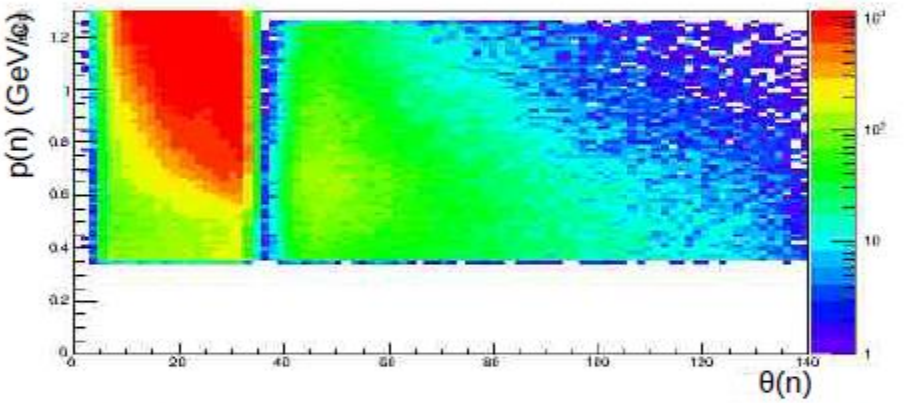
nDVCS analysis: final-state selection

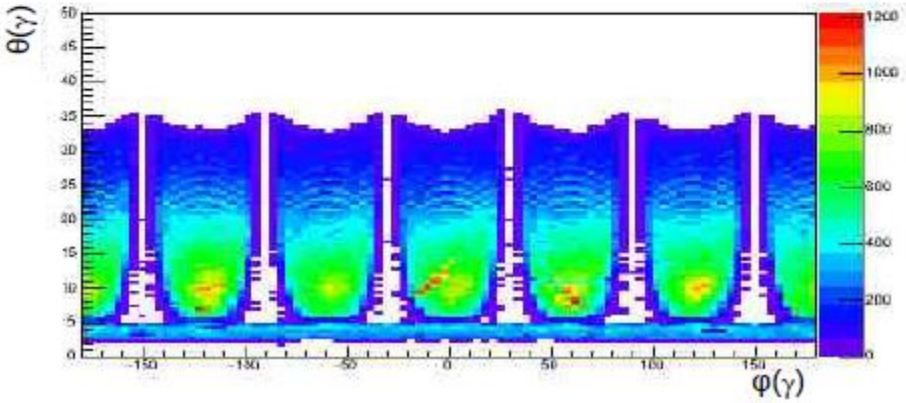


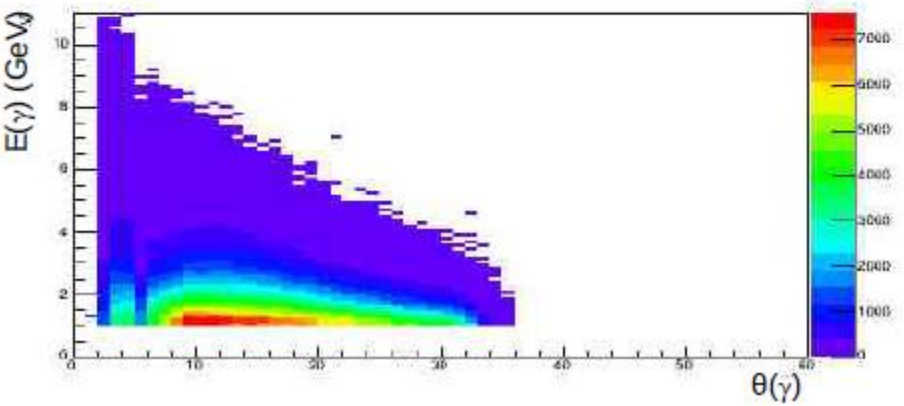


RG-B data





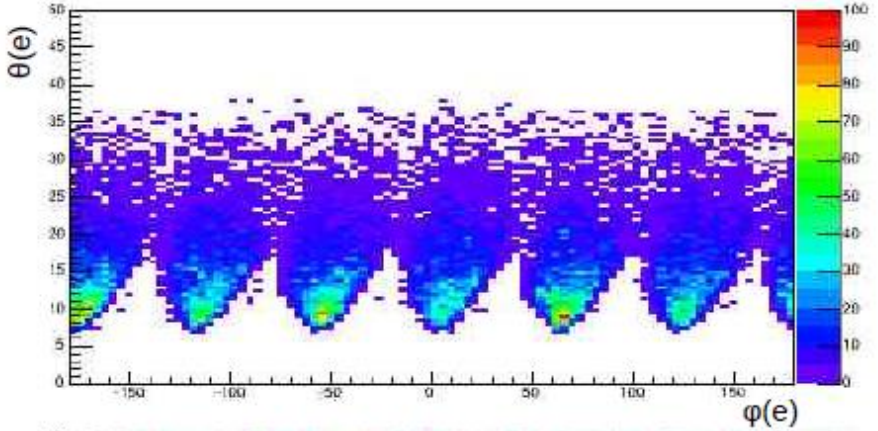


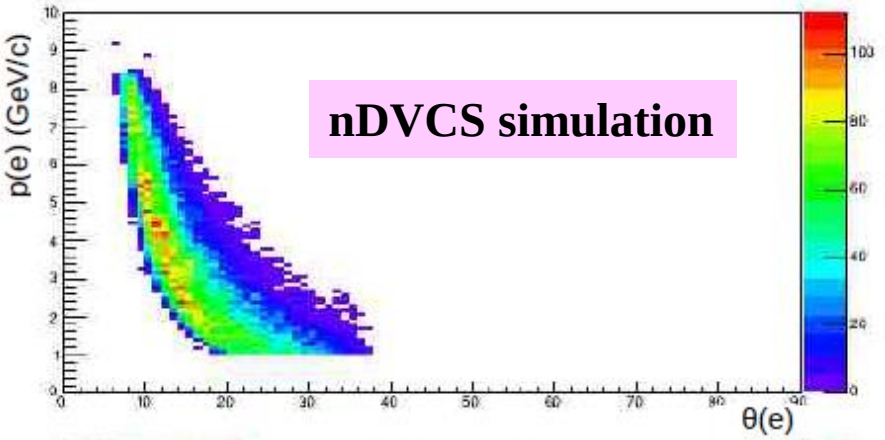


ed→enγ(p)

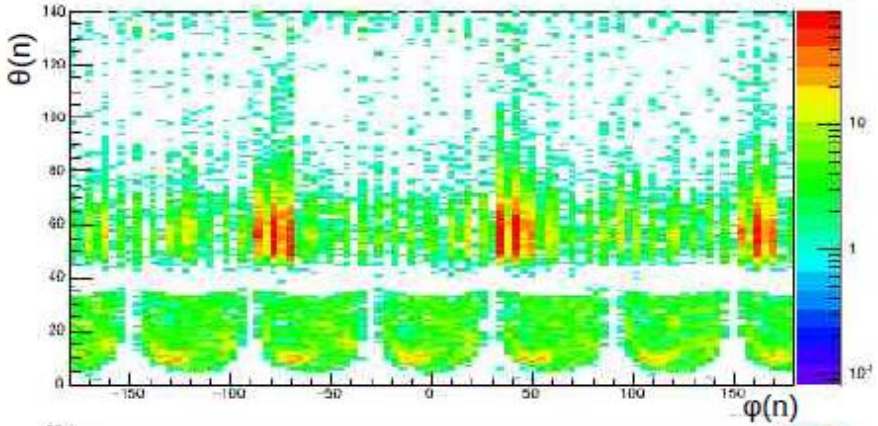
nDVCS analysis: final-state selection

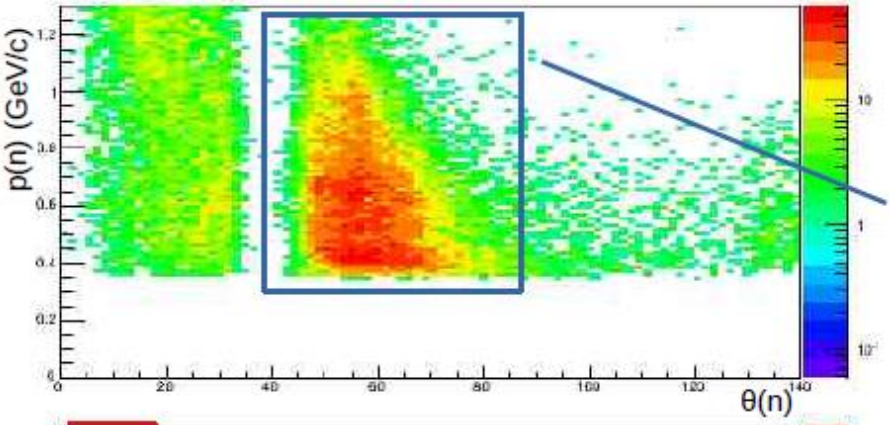
K. Price (DNP'19)



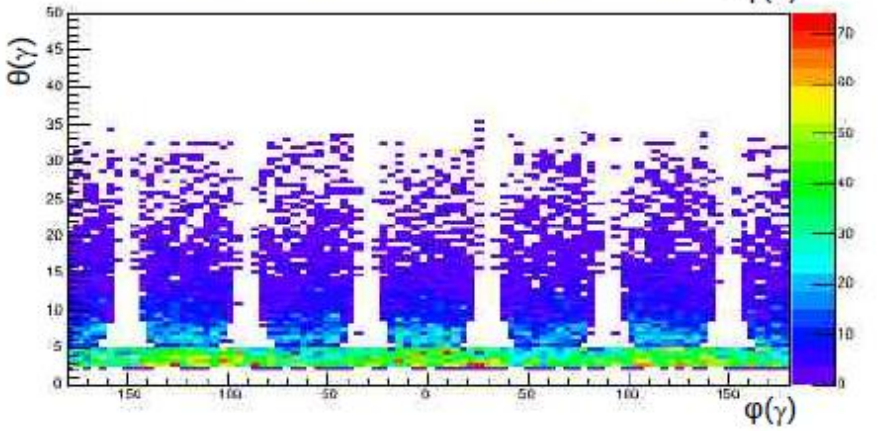


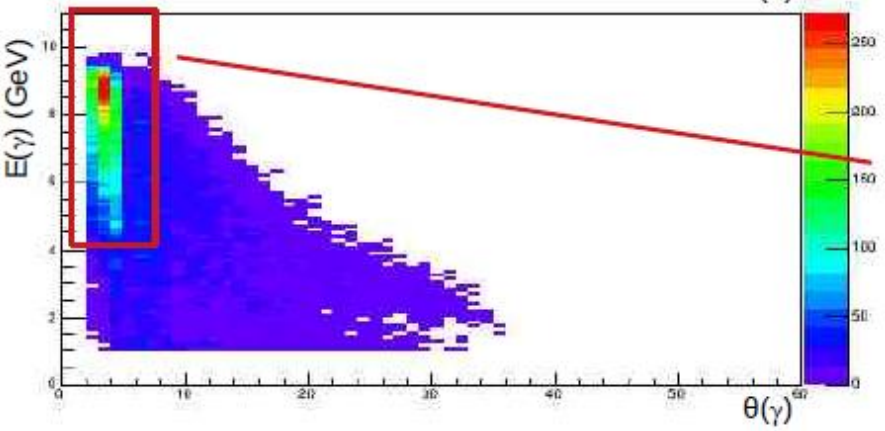
nDVCS simulation





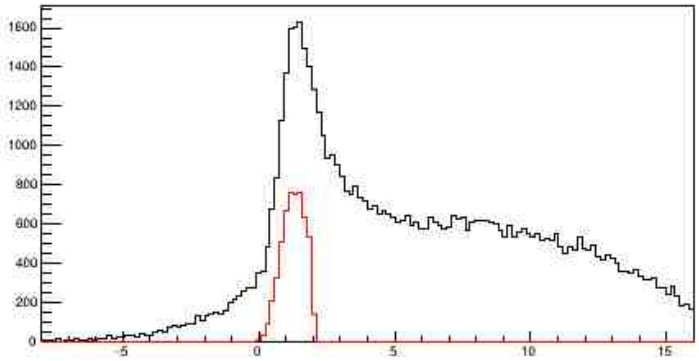
CD



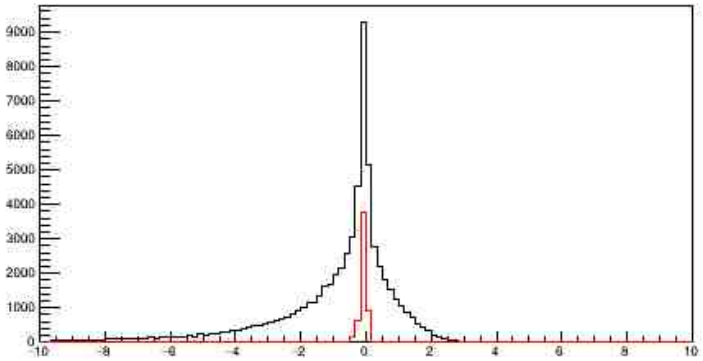


FT

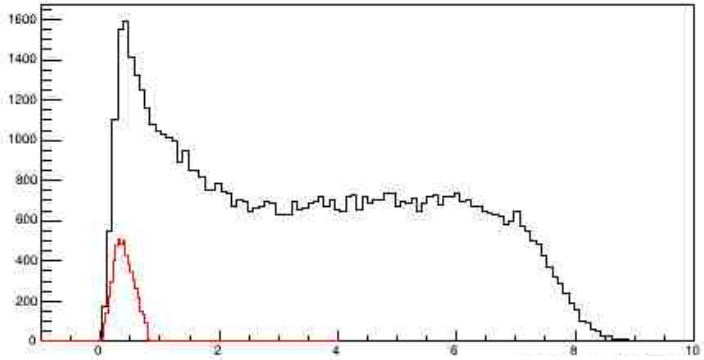
nDVCS analysis: exclusivity cuts (CD-FT)



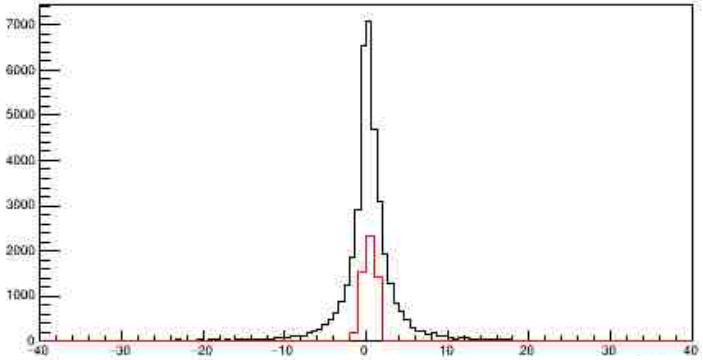
M^2_x (ed→enγX) (GeV²)



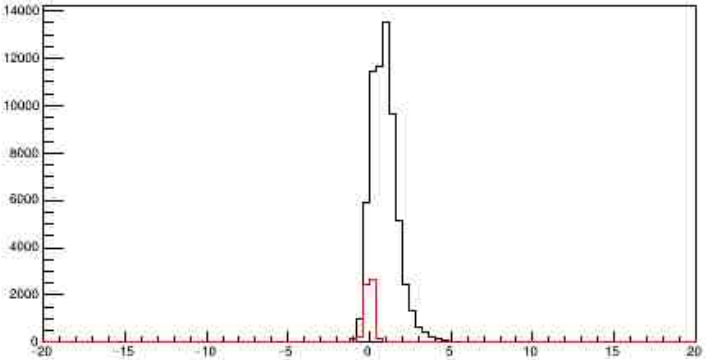
M^2_x (en→enγX) (GeV²)



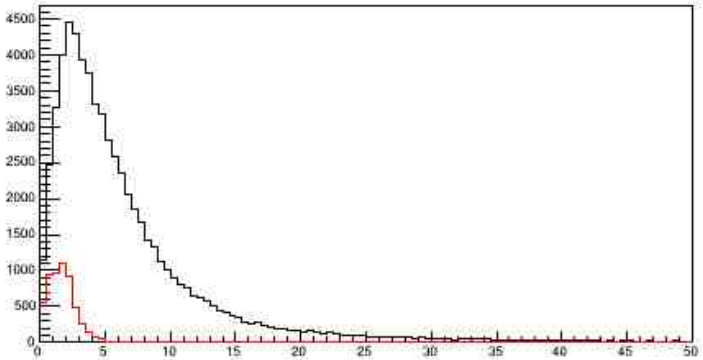
p_x (ed→enγX) (GeV)



Δϕ (deg)



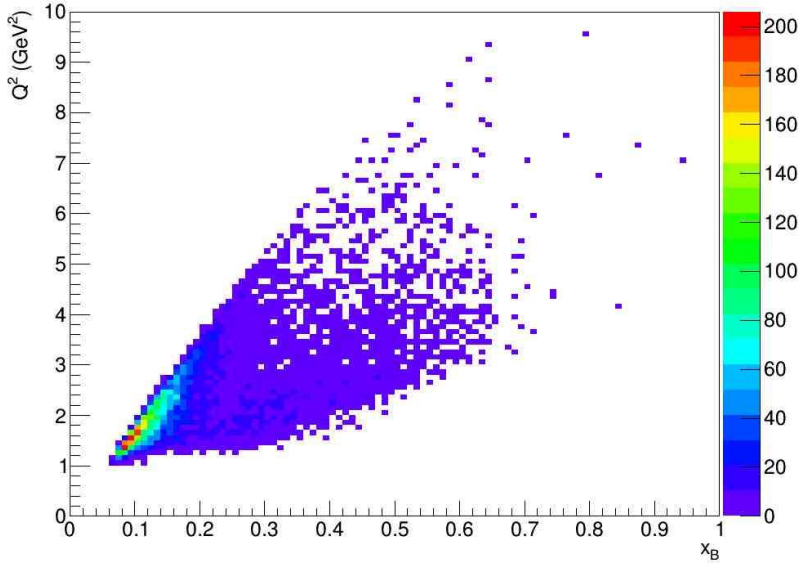
Δt (GeV²)

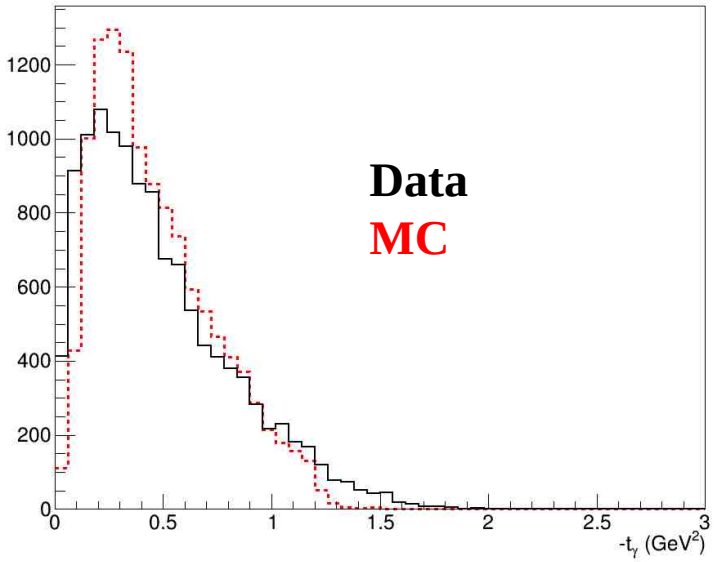


$\theta_{\gamma X}$ (deg)

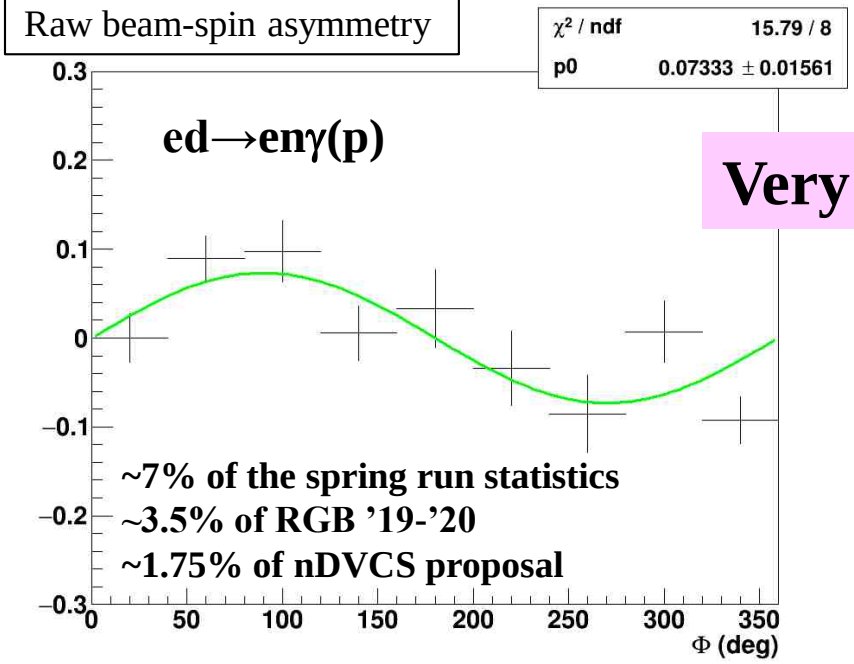
K. Price (DNP'19)

nDVCS analysis: results



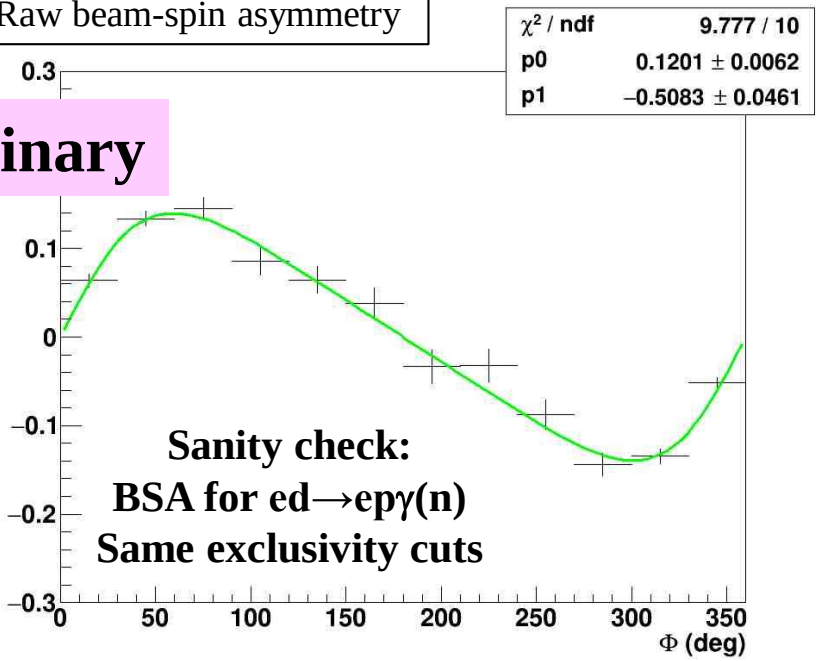


Raw beam-spin asymmetry



Very preliminary

Raw beam-spin asymmetry



Coherent DVCS on deuterium

A. Biselli (DNP'19)

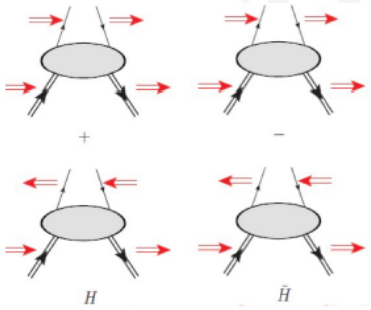
Spin 1 9 GPDs at LO

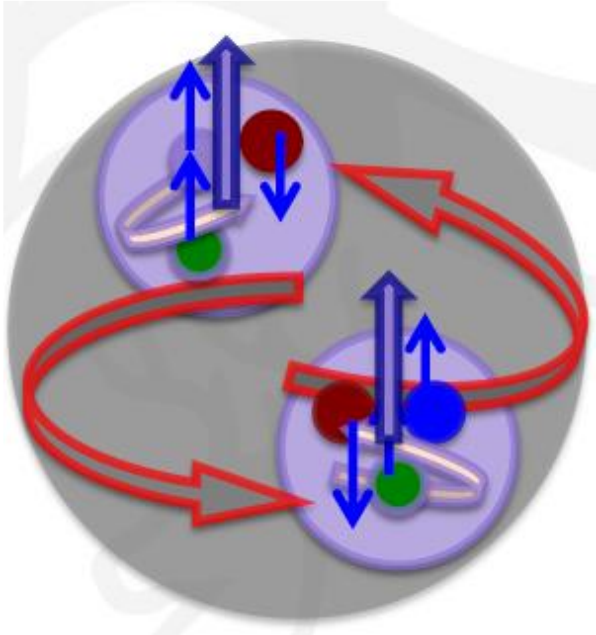
5 vector (unpolarized)

$H_1^i, H_2^i, H_3^i, H_4^i, H_5^i$

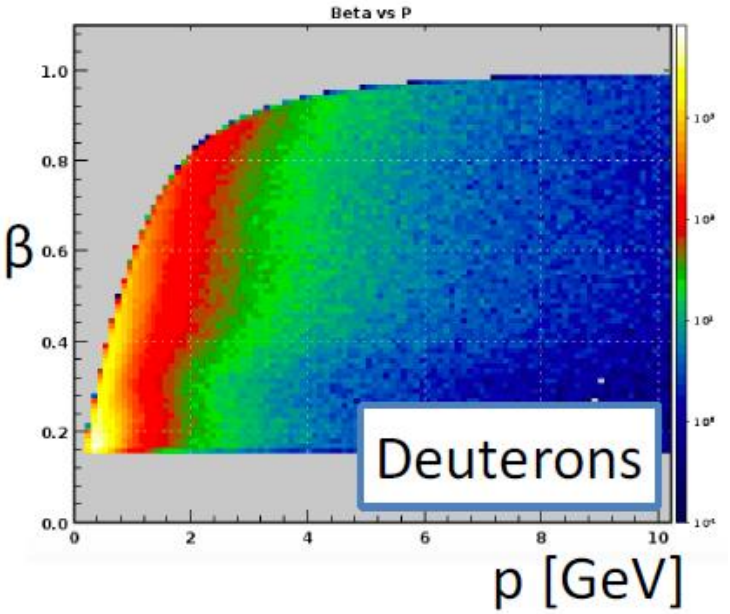
4 axial (polarized)

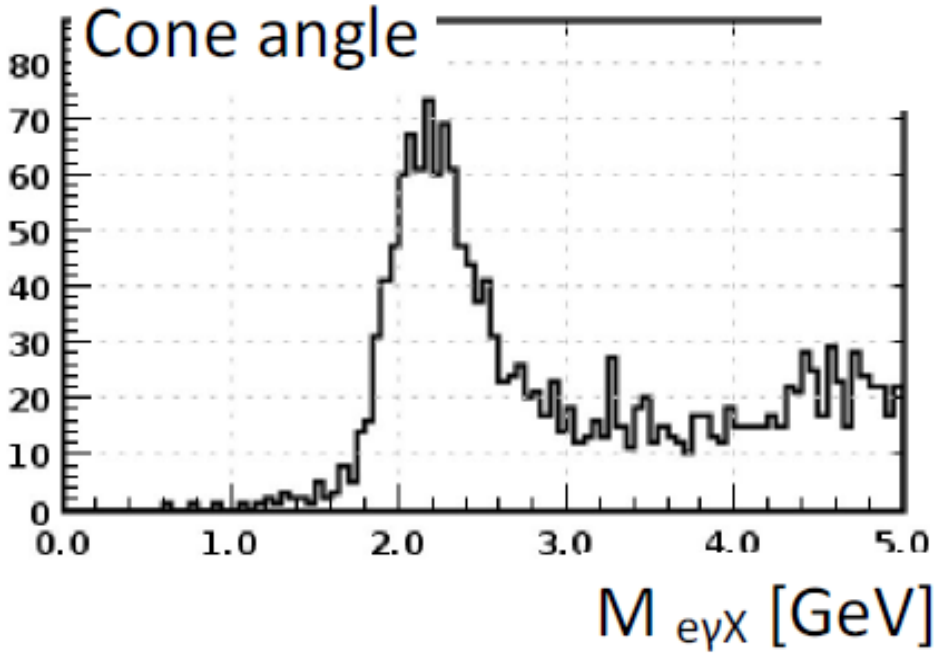
$\tilde{H}_1^i, \tilde{H}_2^i, \tilde{H}_3^i, \tilde{H}_4^i$





$$A_{LU}(\phi) = \frac{x_A(2-y)\sqrt{\frac{-\Delta^2(1-y)}{Q^2}}}{2-2y+y^2} \times \Im m \frac{2G_1\mathcal{H}_1 + (G_1 - 2\tau G_3)(\mathcal{H}_1 - 2\tau\mathcal{H}_3) + \frac{2}{3}\tau G_3\mathcal{H}_5}{2G_1^2 + (G_1 - 2\tau G_3)^2} \times sin(\phi)$$





RG-B part 2: fall/winter run

Run plan:

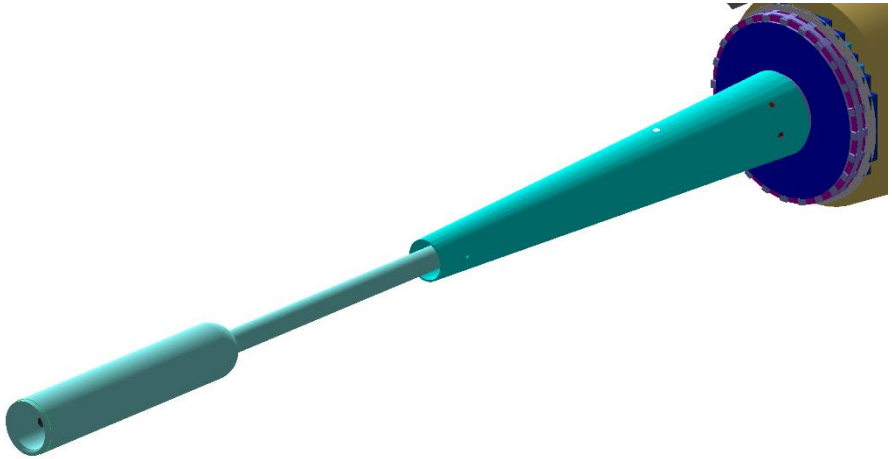
- ✓ Same detector configuration as RG-B spring (FT on, LTCC 3-5, RICH 4)
- ✓ One new trigger bit (opposite sectors, opposite charge, no EMAX) for the new RG proposal
- ✓ Beam energy ~10.5 GeV?
- ✓ Production current = 50 nA
- ✓ Same frequency of special runs

December:

- Torus inbending
- Low-energy (2 pass) run for BAND calibration: December 17-19

January:

- Torus outbending (to be confirmed)
- New scattering chamber to reduce DC occupancies and allow higher current (under construction)



Experiment readyness:

- All detectors are back on, cosmics/calibrations ongoing
- Target underwent maintenance (replaced sensor), now operating with LD2
- Trigger road dictionaries for outbending torus being prepared

Run coordinators:
S. Stepanyan, M. Contalbrigo, D. Sokhan, S. Niccolai, J. Gilfoyle, V. Kubarovsky, B. Mc Kinnon

Monitoring coordinator: Y. Ilieva
Chef: Z. Zhao
Trains: A. Movsisyan,
Analysis coordinator: S. Niccolai

Summary and plan

• RG-B has 7 experiments, sharing the common goal to advance in the multi-dimensional imagining of the nucleon, disentangling the quark flavor dependence

• Strictly linked to RG-A → same running conditions (beam energy, target cell, magnetic fields)

• Detector configuration: same as RG-A (+LD2) + BAND

• The spring run corresponds 24% of the approved beam time

• Beam energy reduction 10.6 → 10.2 GeV affected mainly J/ψ experiment

• Offline data processing for monitoring and calibrations well established

• Good performances of CND and BAND

• 7% of spring run cooked for DNP

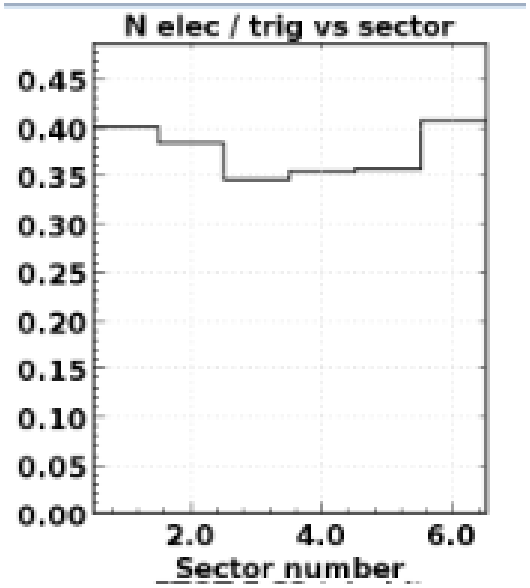
• Preliminary BSA for nDVCS and pDVCS obtained

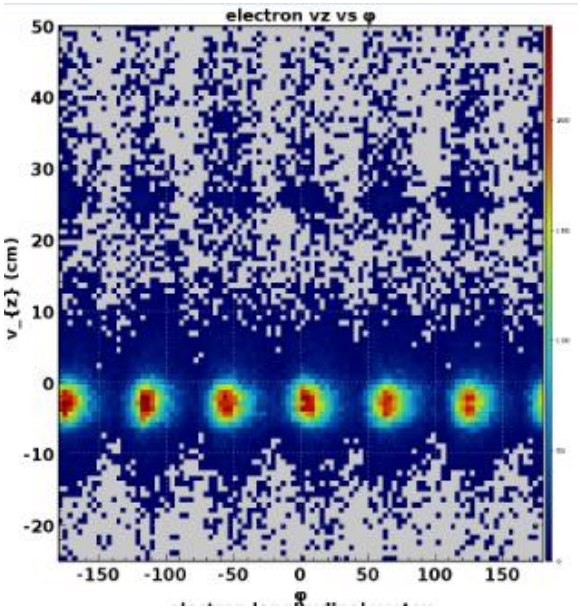
• Promising studies on dDVCS

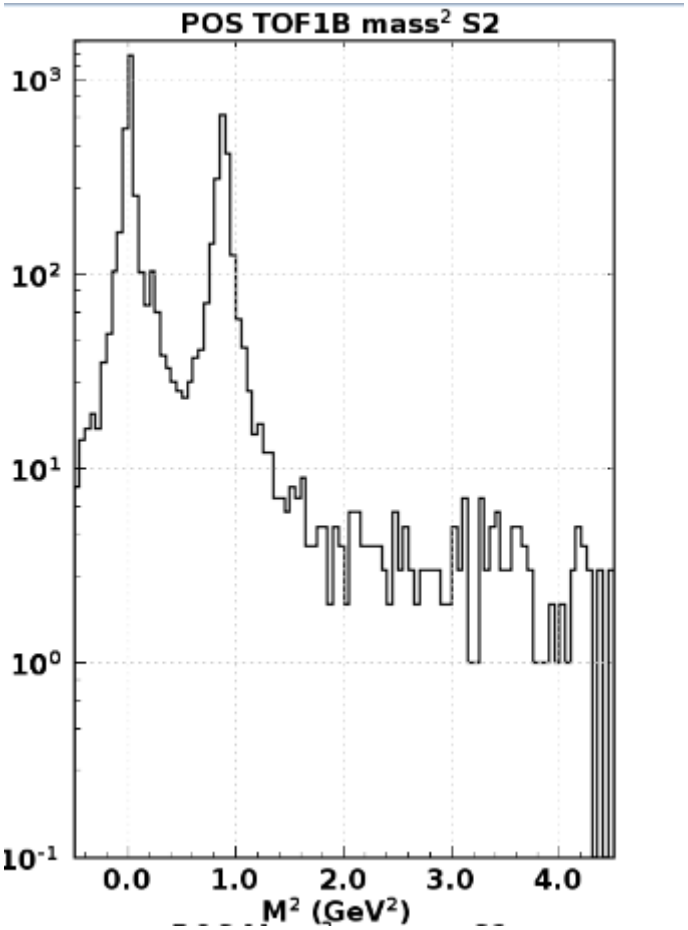
• Fall/winter run approaching, all is ready

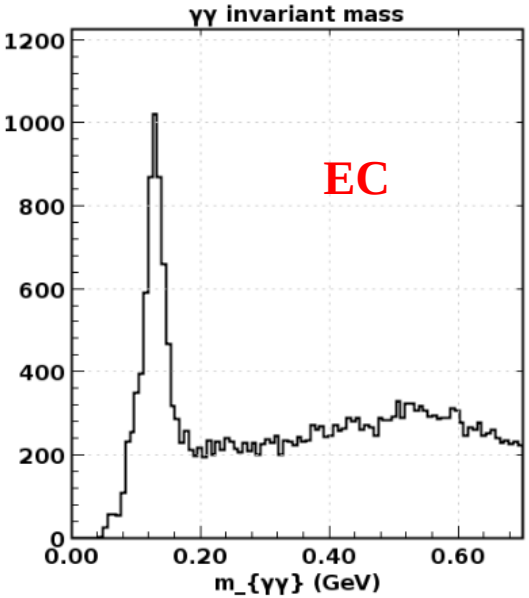
Back-up slides

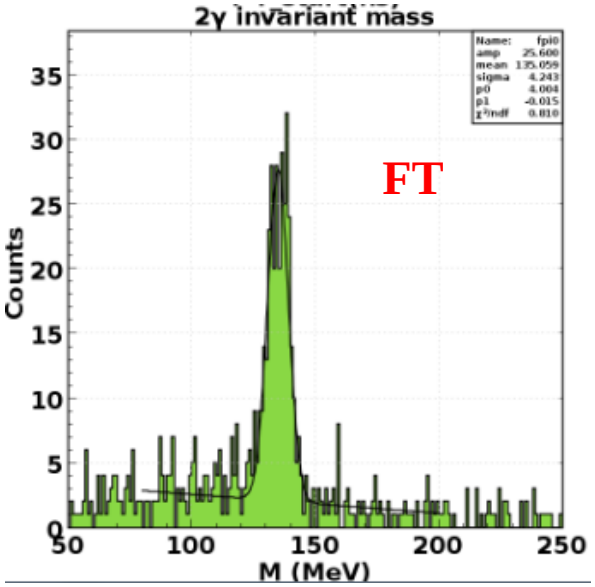
RG-B spring: data quality of selected runs











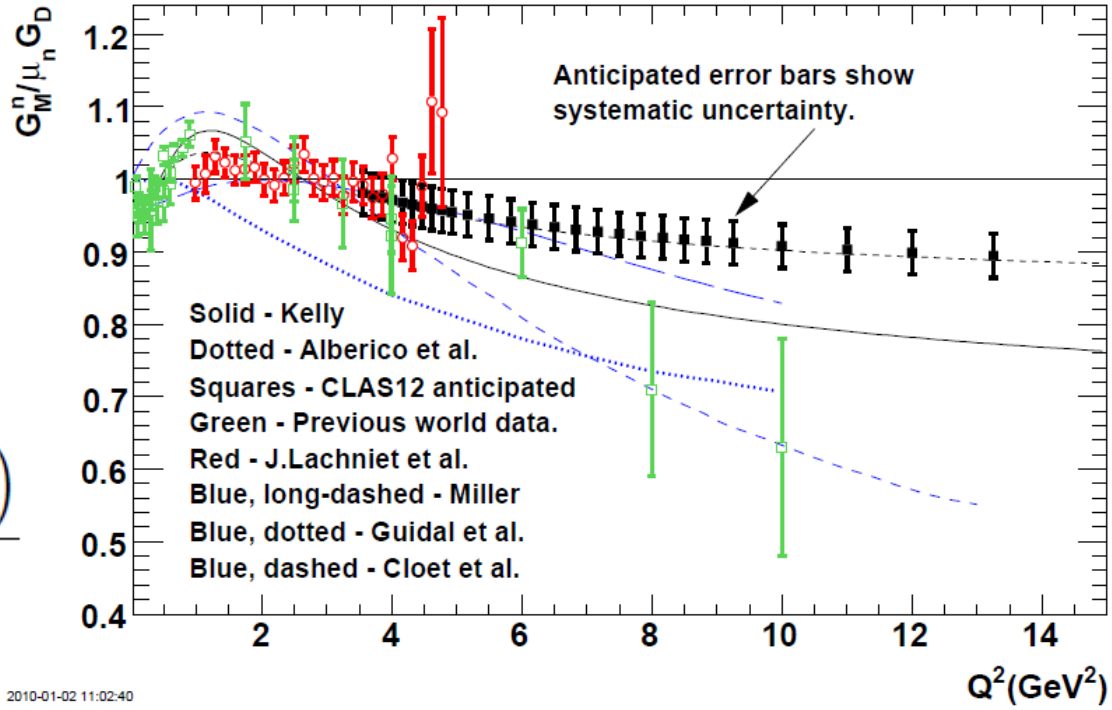
E12-07-104: Measurement of the neutron magnetic form factor at high Q^2 using the ratio method on deuterium

Spokespersons: W. Brooks, G. Gilfoyle, K. Hafidi

Goal: extract G_M^n for $3<Q^2<14$ GeV^2 via the ratio of **quasi-elastic e-n** and **quasi-elastic e-p** on deuteron

$$R = \frac{\frac{d\sigma}{d\Omega}(^2\mathrm{H}(e,e'n)_{QE})}{\frac{d\sigma}{d\Omega}(^2\mathrm{H}(e,e'p)_{QE})} =$$

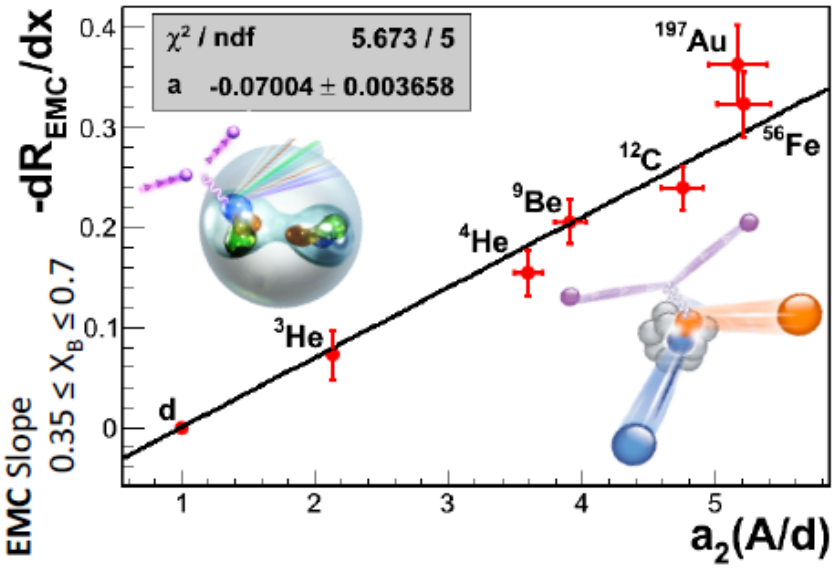
$$= a(Q^2)\frac{\sigma^n_{mott}(G_E^{n\,2} + \frac{\tau_n}{\varepsilon_n}G_M^{n\,2})\left(\frac{1}{1+\tau_n}\right)}{\frac{d\sigma}{d\Omega}(^1\mathrm{H}(e,e')p)}$$

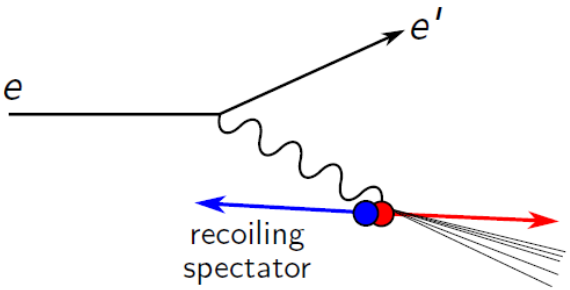


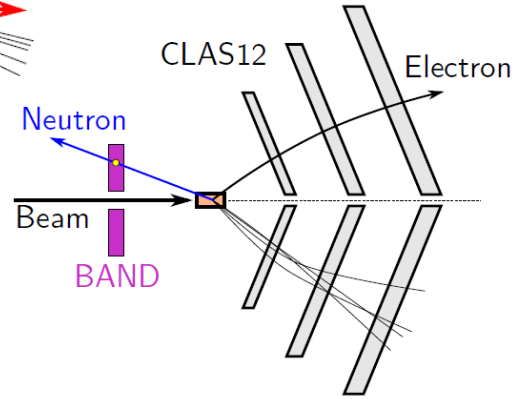
- Both particles of the two quasi-elastic final states will be detected in CLAS12
- Neutrons will be detected in the FEC, PCAL and FTOF
- Neutron efficiency must be frequently monitored to minimize systematics
- Full torus field, inbending
- Approved for 30 days of running

E12-11-003a: In medium proton structure functions, SRC and the EMC effect measured with CLAS12 and the Back Angle Neutron Detector

Spokespeople: O. Hen, L. Weinstein, H. Hakobyan and E. Piasetzky







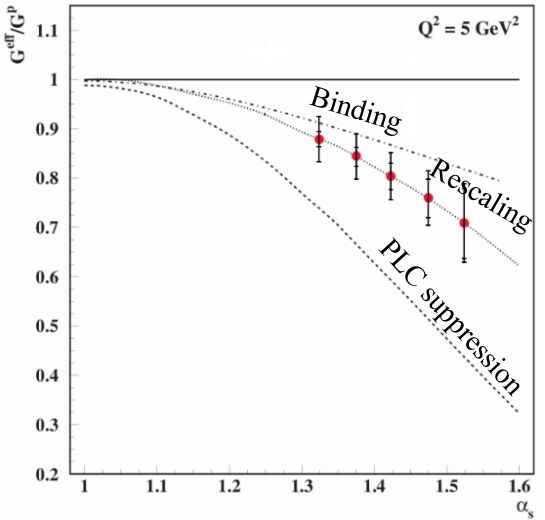
BAND will measure DIS on deuterium tagging a backward high-momentum neutron.

Is the nucleon modification of the EMC Effect due to Mean-Field nucleons or to correlated pairs?

- Measure the **bound proton structure function** as a function of neutron momentum or virtuality in deuterium
- SRC hypothesis predicts modification increasing with virtuality
- A way to select DIS on high-momentum nucleons is needed

Expected results for:

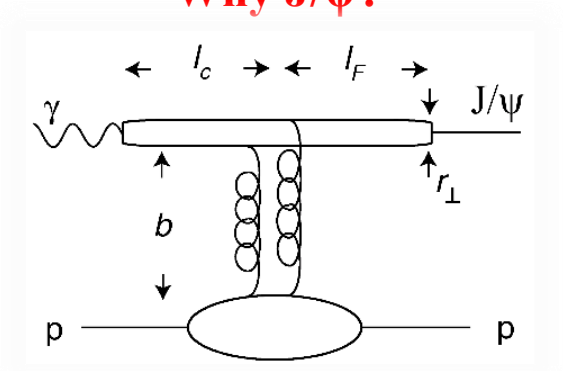
- **75 beam days**
- **Single-cell LD_2**
- **Full field inbending**



Study of J/ψ photoproduction off deuteron

Spokespeople:
Y. Ilieva, B. McKinnon, P. Nadel-Turonski, V. Kubarovsky, S. Stepanyan, Zh.W. Zhao

Why J/ψ?



- Small transverse size: $r_\perp \sim 1/m_c = 0.13$ fm
- Large t at threshold, $|t_{min}| = 1.7$ (GeV/c)^2
- $b \sim 1/|t|^{1/2} = 0.2$ fm
- The $c\bar{c}$ couples to gluon field in the target
- → Process dominated by **multi-gluon exchange**
- Probes the **short-range structure** of the target

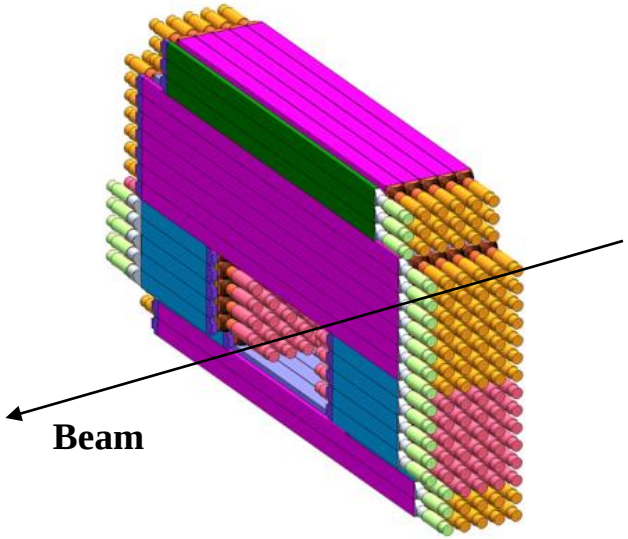
Goals: determine the cross sections of:

- Quasi-free photoproduction off **neutron**: γ(n)→J/ψ n
  - Search for isospin partners of **LHCb pentaquarks**
  - Test **bound-nucleon gluonic form factors**
- Final-State Interactions (J/ψN rescattering)
  - Estimate $\sigma_{J/\psi N}$
- **Coherent** photoproduction: γd→J/ψd
  - Study gluonic form-factor of deuteron

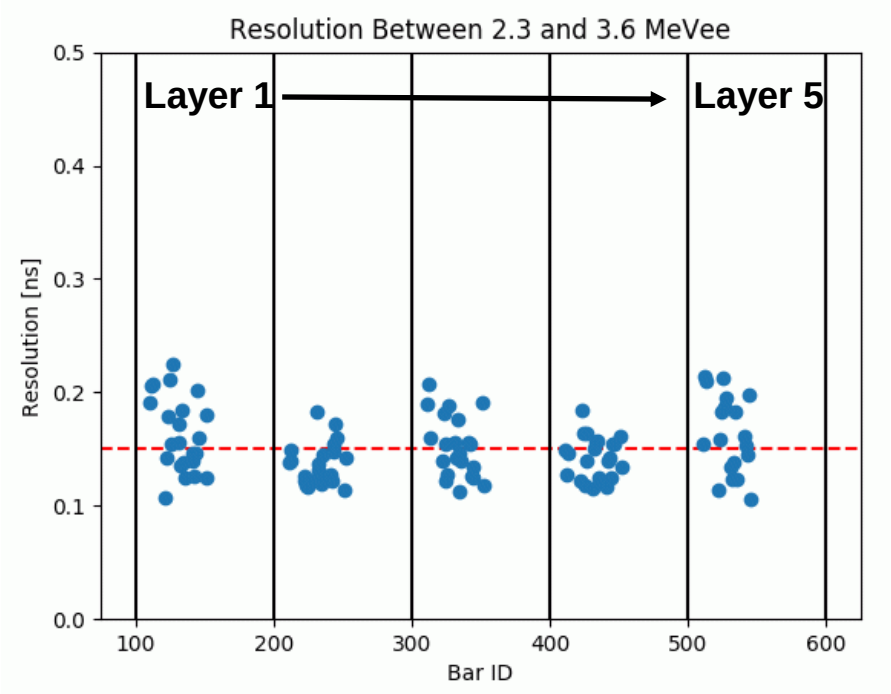
Experimental configuration

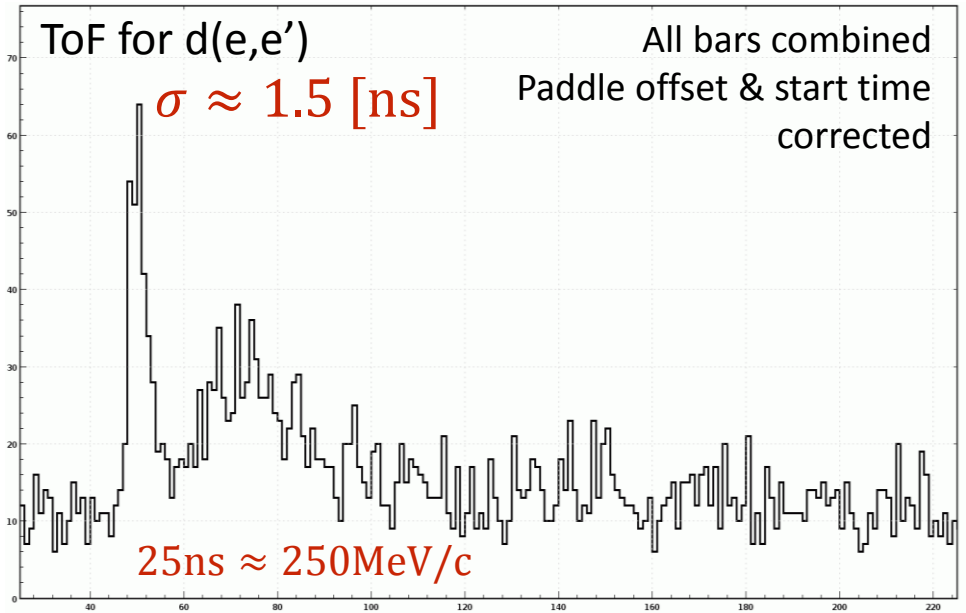
- Unpolarized LD2 target and 11-GeV electron beam, L=10^{35} $s^{-1}cm^{-2}$.
- Standard CLAS electron trigger and a Muon trigger (established during RGA).
- Charged-hadron detection in the Forward and Central Detectors.
- Neutron detection in the Forward Detector (will look for CND capabilities as well).
- Full torus field, electrons in-bending.

BAND: current calibration results



- Angular coverage in θ ~ 155-176°
- Bar resolution < 200 ps (verified)
- Design neutron efficiency of ~35% (*to be studied*)
- Design neutron momentum resolution 1.5% at 450 MeV/c (*to be studied)*





$$\frac{t_L + t_R}{2} - RF$$

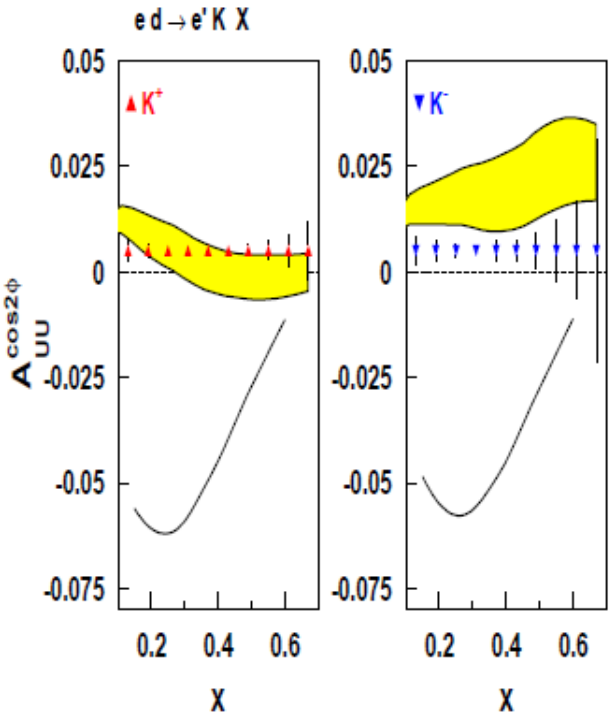
E12-09-008: Boers-Mulders asymmetry in K SIDIS

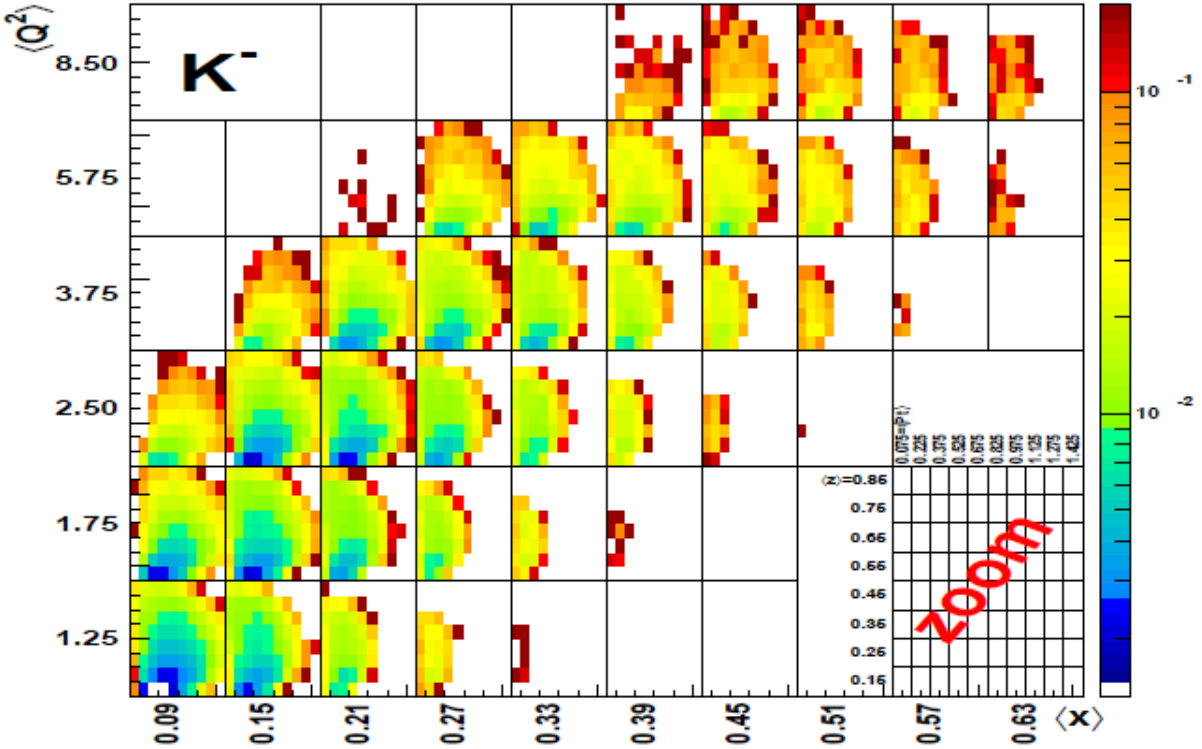
Spokespersons: H. Avakian, M. Contalbrigo, K. Joo, Z. Meziani

Goal: measurement of **spin azimuthal asymmetries** in **K-SIDIS**
→ transverse momentum dependence of **valence quark transverse spin distributions**
→ **spin-orbit correlations**

Azimuthal Modulations of F_{UU}

$$\frac{d^5\sigma^{ep\to e'hX}}{dx\,dy\,dz\,df\,dP_{h\perp}^2} \propto \{F_{UU,T} + \varepsilon F_{UU,L} + \sqrt{2\varepsilon(1+\varepsilon)}\cos(f)F_{UU}^{\cos(f)} + \varepsilon\cos(2f)F_{UU}^{\cos(2f)}\}$$



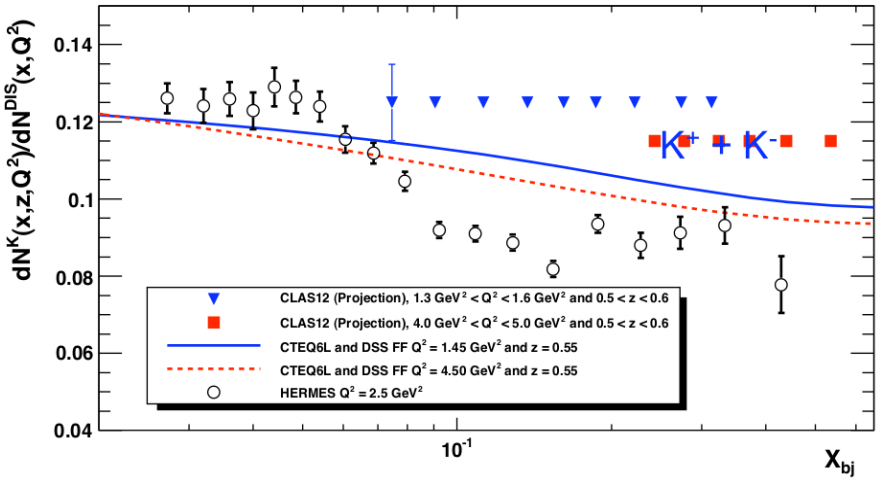


- **RICH** is required for kaon ID
- 56 approved days, 50% (27 days) outbending (opposite field polarity for systematic checks)
- Proton- and deuteron-target data will be combined for flavor separation

E12-09-007a: Study of partonic distributions in SIDIS K production

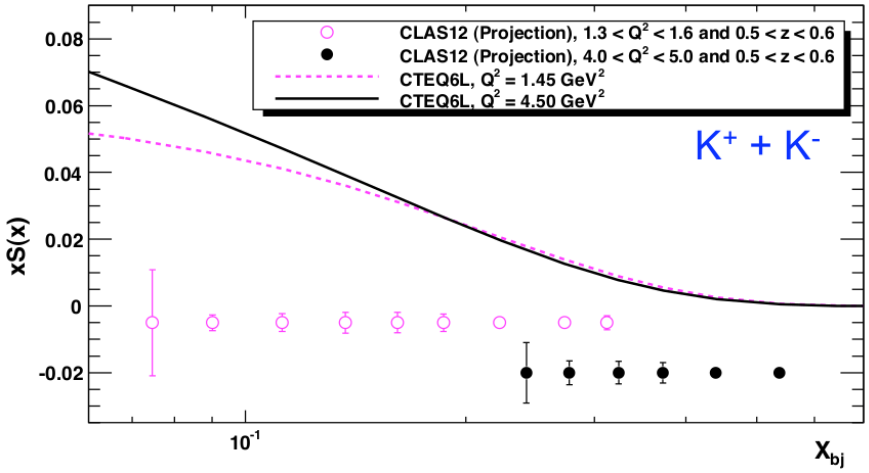
Spokespersons: H. Avakian, F. Benmoktar, A. El Alaoui, K. Hafidi, M. Mirazita
Contact person: W. Armstrong

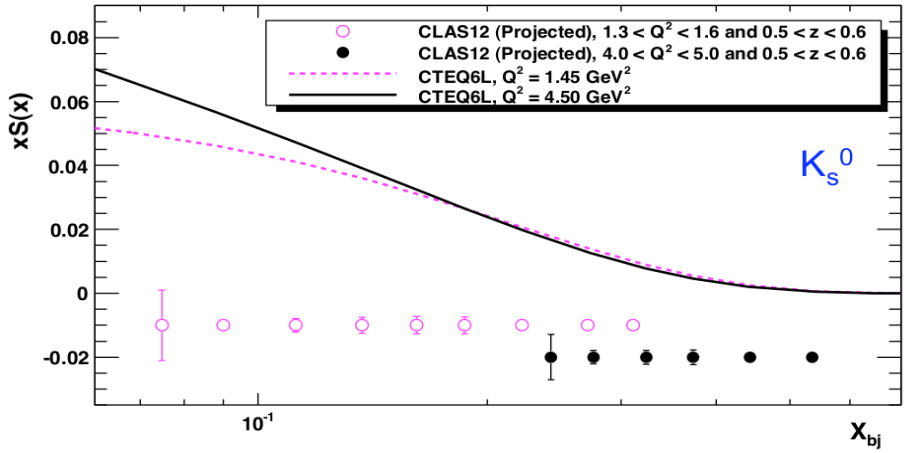
Goal: measure **multiplicities** for various hadrons (π^+, π^-, π^0, K^+, K^-, K^0_s) on deuterium, for $0.05 < x < 0.7$
→ Measure **fragmentation functions** and their Q^2 dependence
→ **Extract strange quark parton distribution functions**



- 56 PAC days (including 2 days of diagnostics)
- H- and D-target data will be combined
- **RICH** necessary for kaon ID
- 50 % of beam time with reverse magnetic field

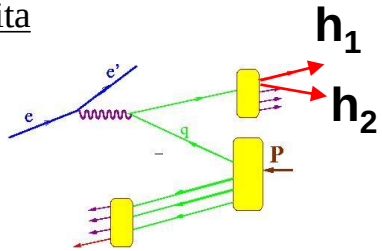
Need **both torus field settings** to eliminate systematic associated with different-charge acceptances.





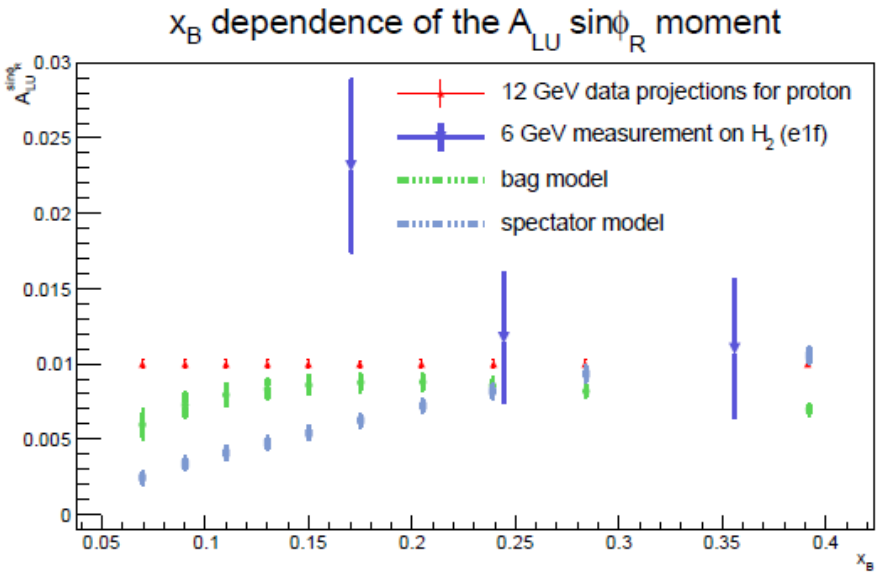
E12-09-008b: Higher-twist collinear structure of the nucleon through di-hadron SIDIS on unpolarized hydrogen and deuterium

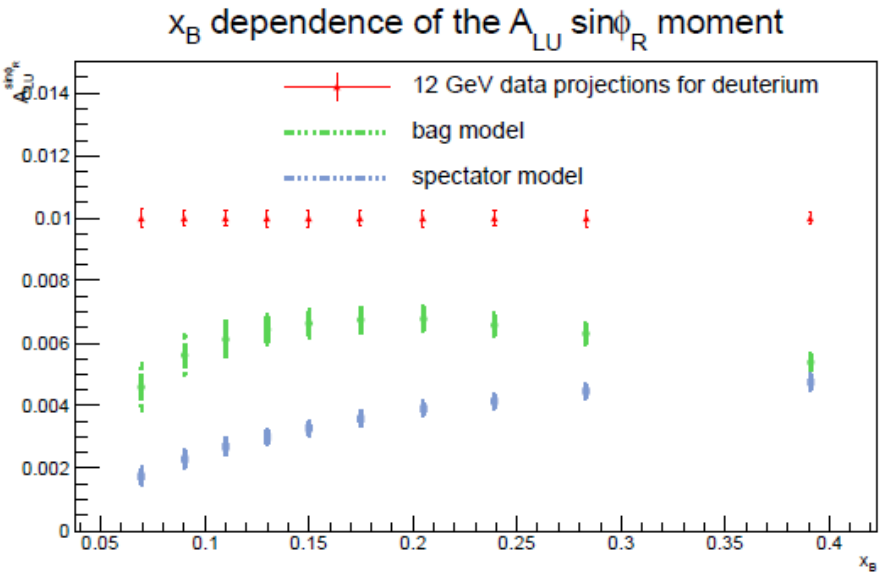
Spokespersons: S. Pisano, A. Courtoy
Contact person: M. Mirazita



Goals:

- Measure **multiplicities** and **beam spin asymmetry**
- Extract the unpolarized di-hadron Fragmentation Function and the collinear PDF e(x)





Also: 3D extraction of the BSA in (x_B, z, m_{pp}) bins on proton (RG-A) and deuteron (RG-B)

Measuring on both proton and deuteron will allow flavor decomposition

E12-11-003: DVCS on the neutron

ed→ e(p)nγ Fully exclusive final state: CLAS12+FT+CND

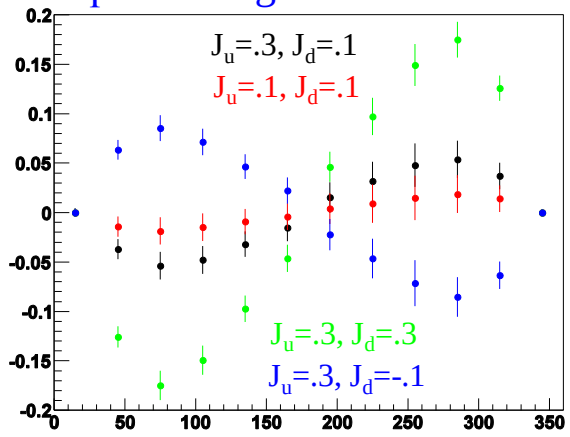
Spokespersons: A. El Alaoui,V. Kubarovsky, S. Niccolai, S. Pisano, D. Sokhan

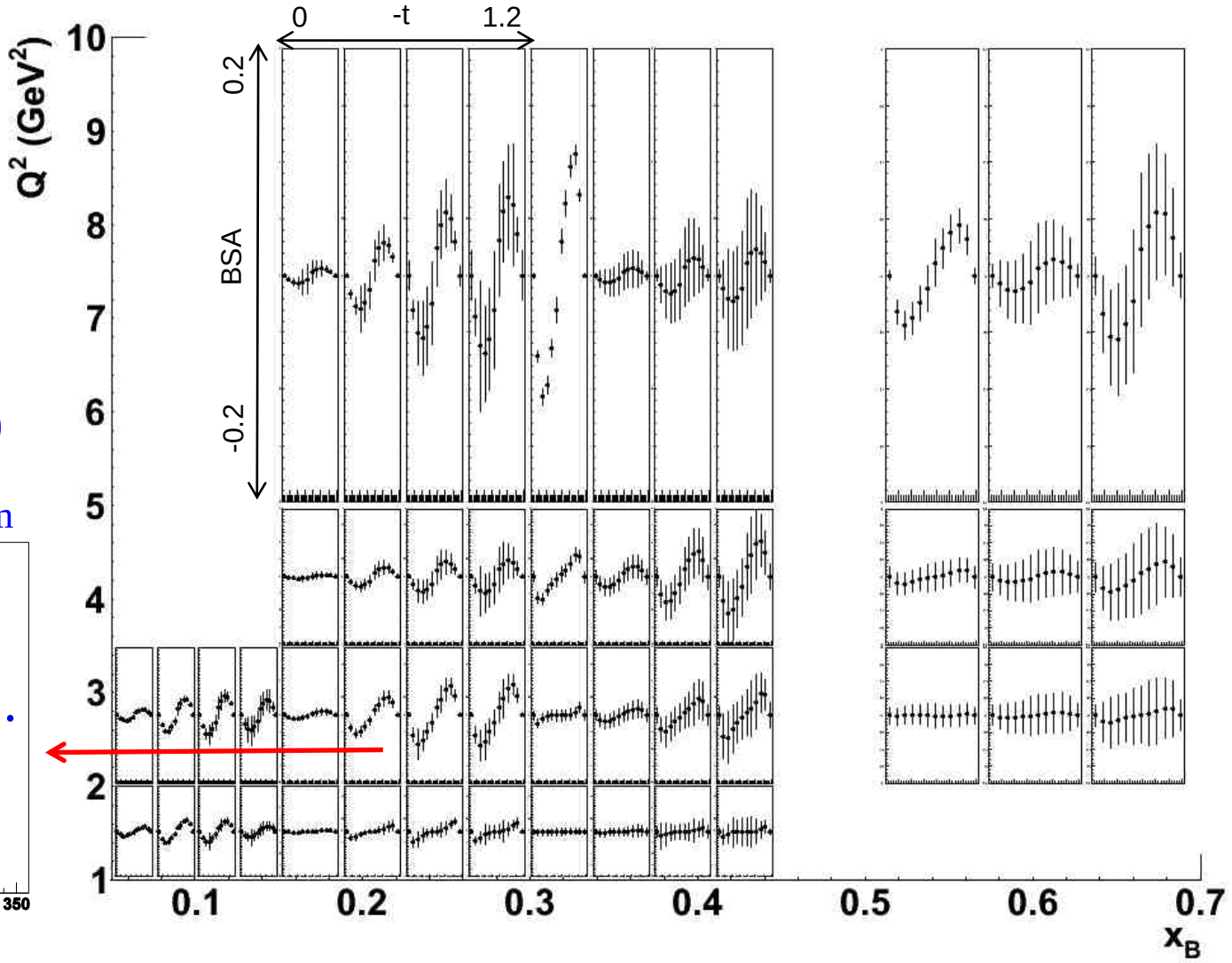
Goal: nDVCS beam-spin asymmetry, the most sensitive observable to the **GPD E**

- Liquid deuterium target
- L = 10^{35} /nucleon
- Full field, inbending
- 90 days

JLab PAC: **high-impact experiment**

Model predictions (VGG) for different values of quarks' angular momentum





Flavor decomposition of parton distributions

• Proton and neutron have different flavor compositions → observables on these two target types are linked to different mixtures of quark structure functions

$$A_1^{p,n}(x) = \frac{\sum e_i^2 \Delta q_i(x,Q^2)}{\sum e_i^2 q_i(x,Q^2)}$$

Virtual-photon asymmetry from DIS

$$A_p^{\pi^+-\pi^-}(x) = \frac{4\Delta u_V(x) - \Delta d_V(x)}{4u_V(x) - d_V(x)} \qquad A_d^{\pi^+-\pi^-}(x) = \frac{\Delta u_V(x) + \Delta d_V(x)}{u_V(x) - d_V(x)}$$

SIDIS pion asymmetry
(integrated over k_T)

$$\sigma_{KM}^{K^+}(p) = 4h_{1L}^{\perp u} H_1^{\perp(1/2)u/K^+} + h_{1L}^{\perp d} H_1^{\perp(1/2)d/K^+} + h_1^{\perp \bar{s}} H_1^{\perp(1/2)\bar{s}/K^+}$$
$$\sigma_{KM}^{K^+}(n) = 4h_{1L}^{\perp d} H_1^{\perp(1/2)u/K^+} + h_{1L}^{\perp u} H_1^{\perp(1/2)d/K^+} + h_1^{\perp \bar{s}} H_1^{\perp(1/2)\bar{s}/K^+}$$

SIDIS $A_{UL}^{\sin 2\phi}$ for K^+

$$\mathcal{H}_p(\xi,t) = \frac{4}{9}\mathcal{H}_u(\xi,t) + \frac{1}{9}\mathcal{H}_d(\xi,t) \qquad \mathcal{H}_n(\xi,t) = \frac{1}{9}\mathcal{H}_u(\xi,t) + \frac{4}{9}\mathcal{H}_d(\xi,t)$$

Compton form factors
from DVCS

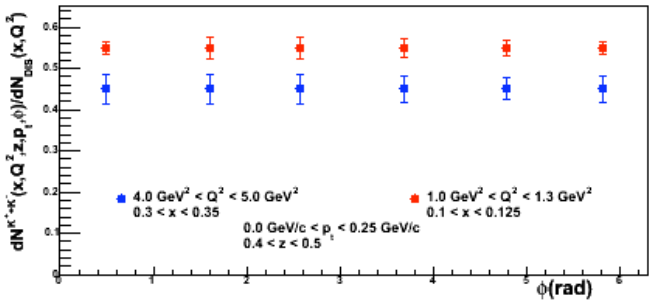
Experiments on proton and deuterium targets must be performed to extract the flavor dependence of the various kinds of parton distributions

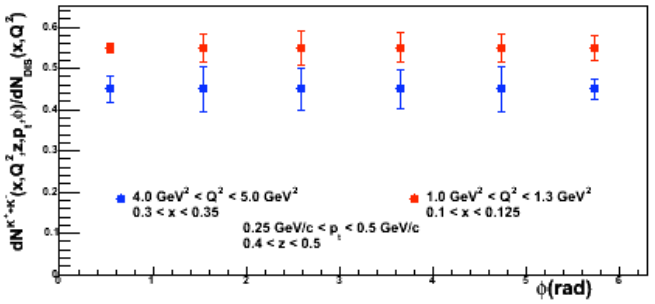
E12-09-007a: Study of partonic distributions in SIDIS K production

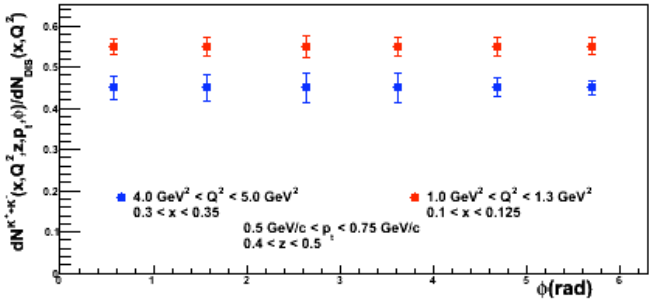
Spokespersons: H. Avakian, F. Benmoktar, A. El Alaoui, K. Hafidi, M. Mirazita

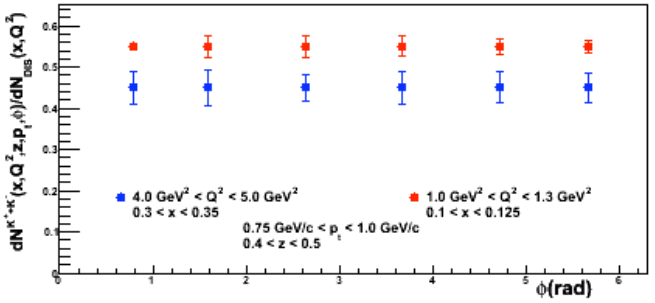
Goal: measure **multiplicities** for various hadrons (π^+, π^-, π^0, K^+, K^-, K^0_s) on deuterium, for $0.05 < x < 0.7$
→ improve parametrizations of **fragmentation functions**
→ **strange parton distribution functions**

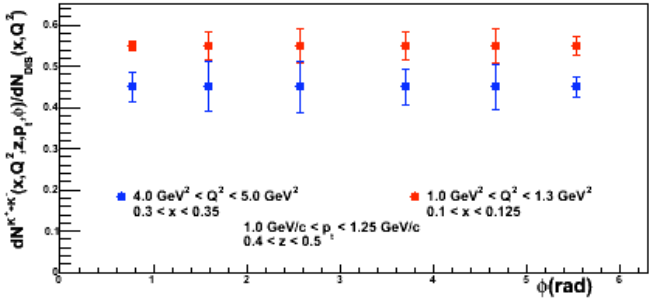
- Part of an extensive program on unpolarized and polarized **proton and deuterium** targets (**RG-C**)
- 56 days approved
- **RICH** necessary for kaon ID

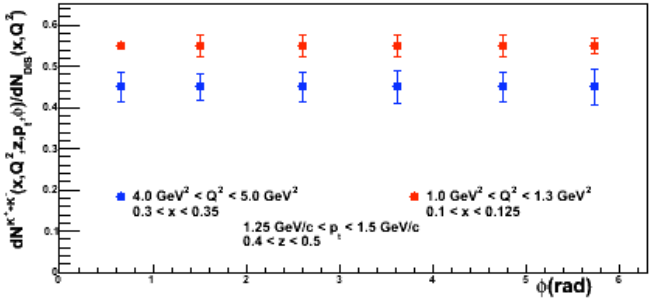






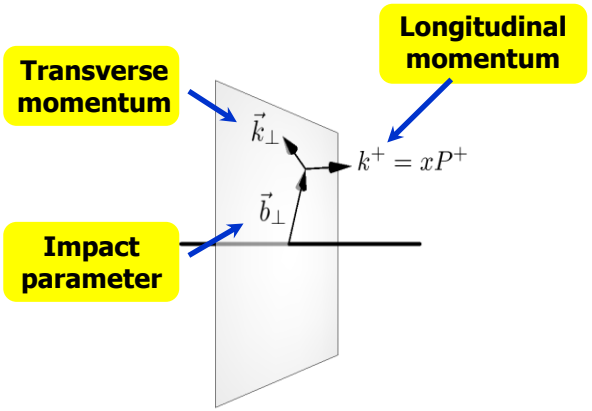


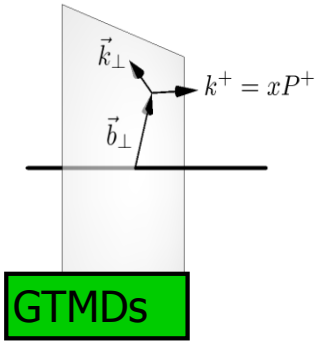




Multi-dimensional mapping of the nucleon

A complete picture of nucleon structure requires the **measurement of all these distributions**.





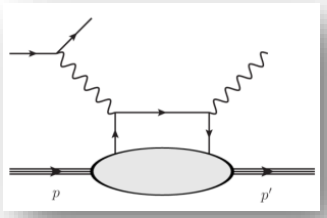
GTMDs

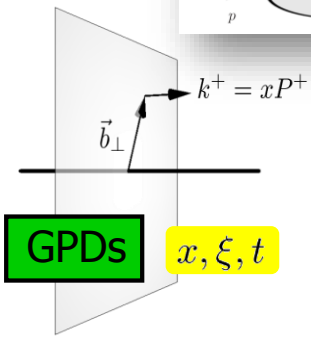
$x, \xi, k_\perp^2, \vec{k}_\perp \cdot \vec{\Delta}_\perp, t$

$\int \mathrm{d}^2\vec{k}_\perp$

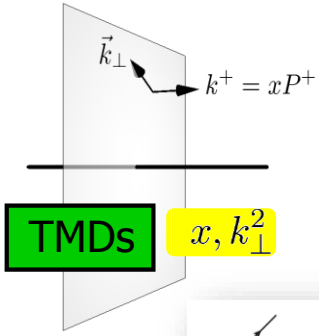
$\int \mathrm{d}^2\vec{b}_\perp$

DVCS



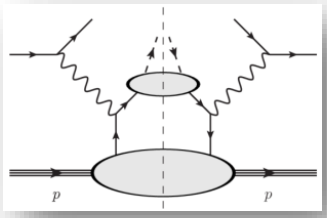


GPDs x, ξ, t



TMDs $x, k_\perp^2$

SIDIS

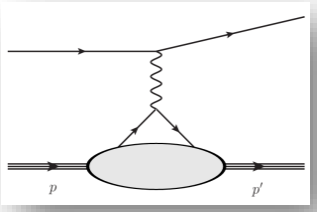


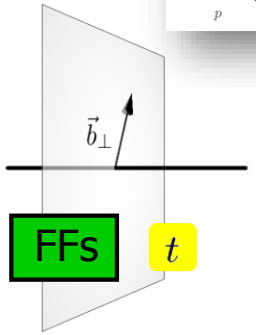
$\int \mathrm{d}x$

$\int \mathrm{d}^2\vec{b}_\perp$

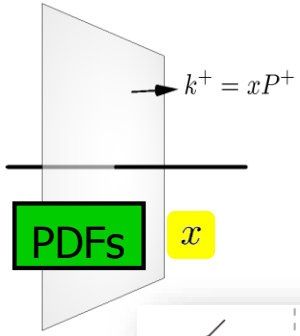
$\int \mathrm{d}^2\vec{k}_\perp$

Elastic Scattering



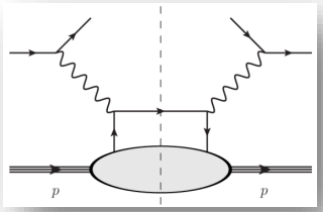


FFs t



PDFs x

DIS



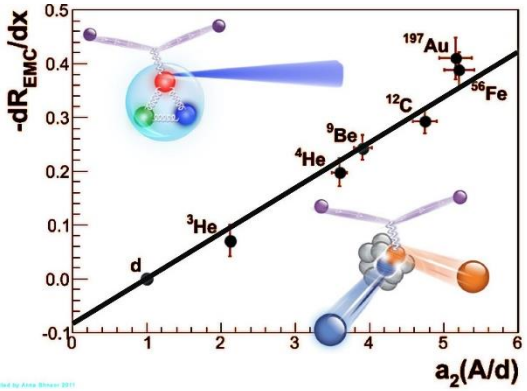
Run-Group B aims to measure all these distributions, using **deuteron** as a **neutron target** → **Quark-flavor separation, combining with proton results**

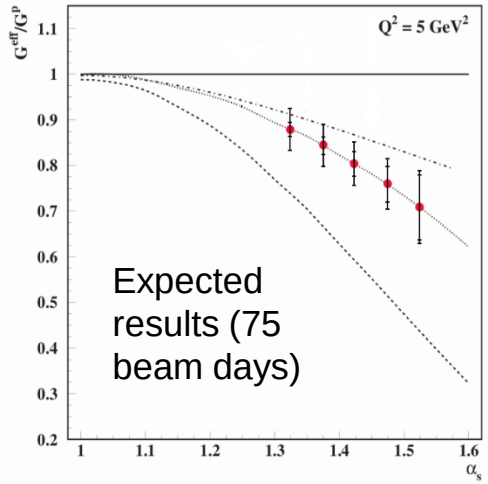
+ EMC effect, SRC
+ J/ψ photoproduction on deuteron

In Medium Proton Structure Functions, SRC and the EMC Effect measured with CLAS12 and the Back Angle Neutron Detector

Spokespeople: O. Hen, L. Weinstein, H. Hakobyan and E. Piasetzky

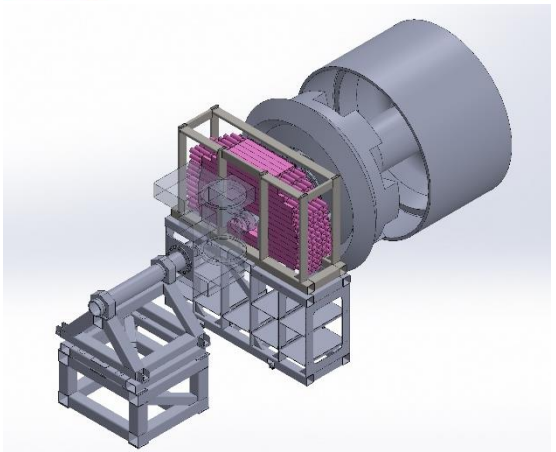
- Is the nucleon modification of the EMC-Effect due to Mean-Field nucleons or correlated pairs?
- Measure the **bound proton structure function** as a function of neutron momentum or virtuality in deuterium
  - Similar to **nucleon tagging in BoNuS**





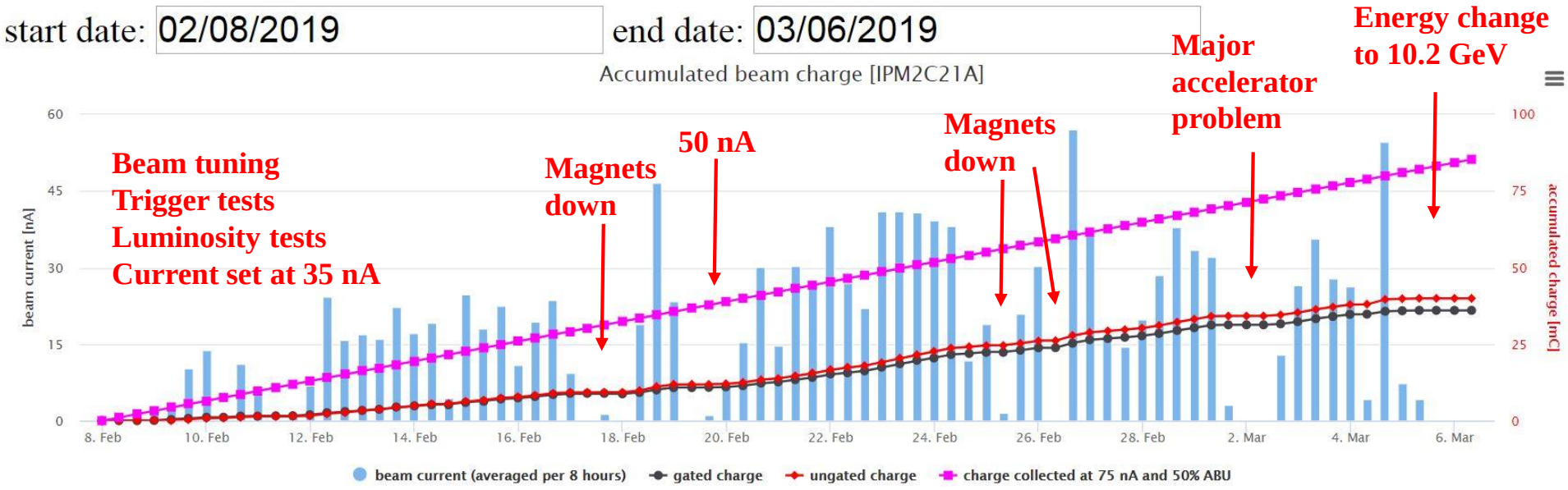
Build new scintillator-based **Back Angle Neutron Detector**

- 160-170^o
- ~ 35% neutron detection efficiency
- ~ 7x7 cm^2 scintillators
- funded and constructed by Tel Aviv, MIT, ODU, UTSM, and FSU



More details in the BAND section of the ERR

Progress of the experiment



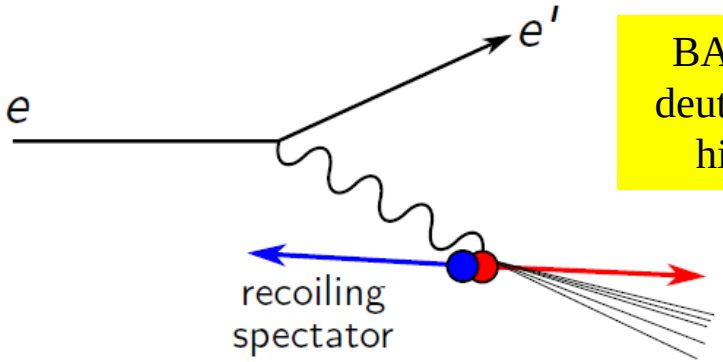
Spring run: 2/8 - 3/19 → **39 days** (actual start on 2/10)
75 nA at 50% ABU → 126.36 mC
Today (6/3/2019): 36.02 mC → **~28.5% of the spring run expectations of collected charge**
We ran so far for 26 days ~67% of the spring-run duration

Fall run: 10/31 - 12/21 → **52 days**
75 nA at 50% ABU →168.48 mC
Total expected charge for 2019 RGB run: 294.84 mC
Total number of calendar days: 91 (= half of the approved beam time)

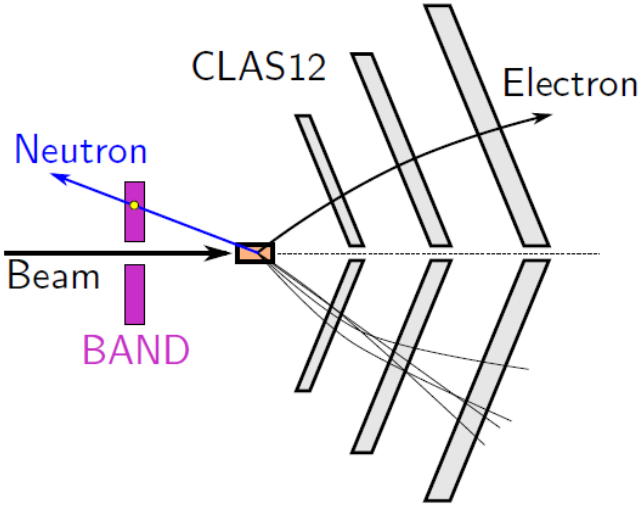
Now we are at 12.2% in terms of collected charge, and used up 28% of the 2019 running time

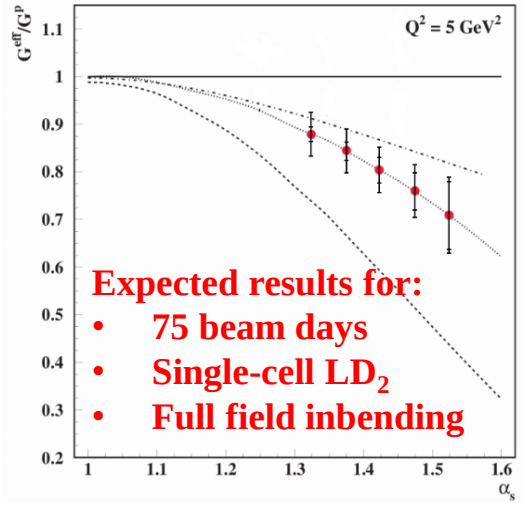
E12-11-003a: In medium proton structure functions, SRC and the EMC effect measured with CLAS12 and the Back Angle Neutron Detector

Spokespeople: O. Hen, L. Weinstein, H. Hakobyan and E. Piasetzky



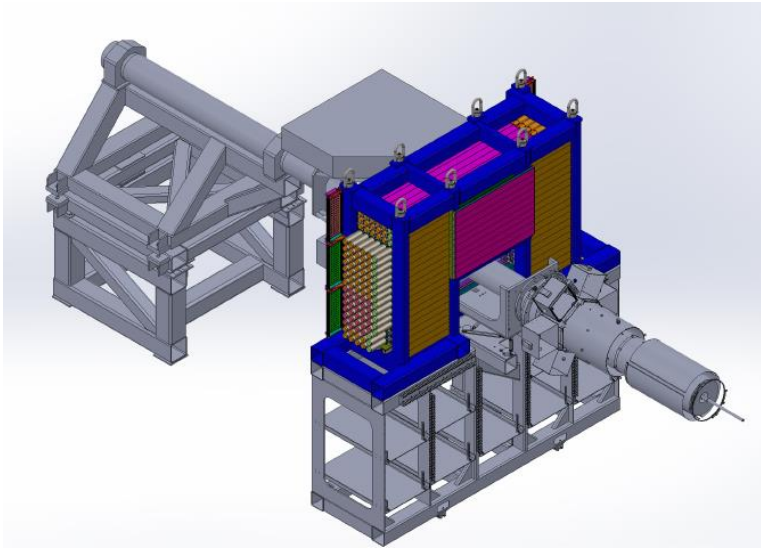
BAND will measure DIS on deuterium tagging a backward high-momentum neutron.





BAND: new scintillator-based **Back Angle Neutron Detector**

- 160-170^o
- ~ 40% neutron detection efficiency
- ~ 7x7 cm^2 scintillators
- $\Delta p/p > 1.5\%$
- funded and constructed by Tel Aviv, MIT, ODU, UTSM, and FSU



Study of J/ψ photoproduction off deuteron

Experimental Configuration

- Unpolarized LD2 target and 11-GeV electron beam, $L=10^{35}\ s^{-1}cm^{-2}$.
- Standard CLAS electron trigger and a Muon trigger (established during RGA).
- Charged-hadron detection in the Forward and Central Detectors.
- Neutron detection in the Forward Detector (will look for CND capabilities as well).
- Full torus field, electrons in-bending.

Expected yields

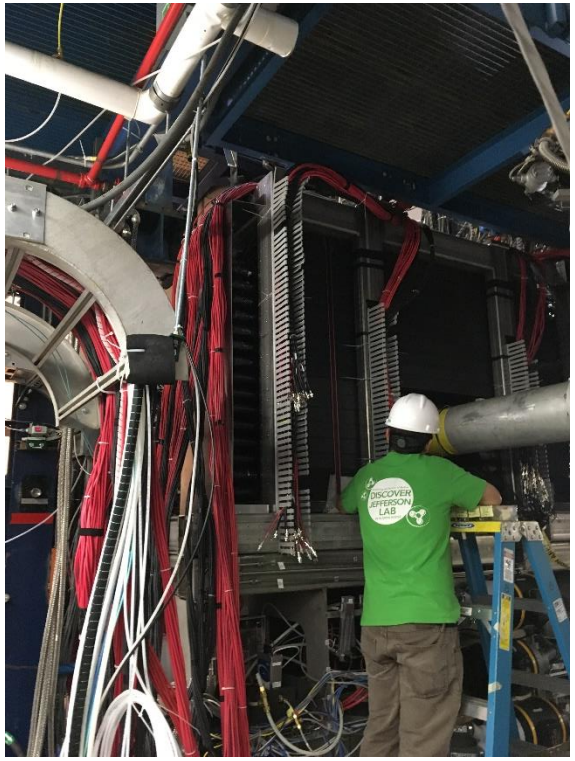
- Quasi-free production off neutron: ~30 J/ψ per day (including both, e^+e^- and $\mu^+\mu^-$ decays).
- Incoherent production: < 3 J/ψ per day (including both, e^+e^- and $\mu^+\mu^-$ decays).
- Coherent production: ~ 0.3 – 1 J/ψ per day (including both, e^+e^- and $\mu^+\mu^-$ decays).

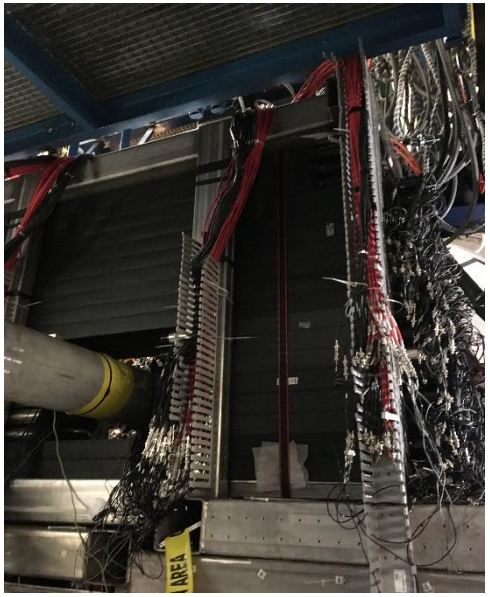
BAND: description and installation

Back Angle Neutron Detector

- 160 – 170^{o}
- ~ 40% neutron efficiency
- Plastic scintillator

- 116 7.2 x 7.2 cm^2 bars read out on both ends
- Veto Layer
  - 24 2 x 7.2 cm^2 bars
  - one 2” PMT per bar
- Installed in the hall on top of SVT cart in August





Run group B: trigger

Electron trigger

HTCC	> 2 phe
ECAL+PCAL	> 250-300 MeV
DC ROAD	Data based
Track-PCALU	Space correlation
Sign of the particle	Negative
Trigger purity	**54%** of events have PID=11 particle
Current	50 nA
Trigger Rate @50 nA	**5 kHz**

2-muons opposite-sectors trigger

PCAL	> 10 MeV
ECAL	40<E<120 MeV
FTOF-PCALU	Space correlation
DC ROAD	GEMC based
Sign of the particle	Positive and Negative
Trigger purity	**28%** of events have 2 +/- TB tracks
Current	50 nA
Trigger Rate @50 nA	**10 kHz**

Main difference with RGA: FT is used to take data but it is not part of the trigger