Diffraction Physics and PHENIX

Stephen C. Johnson
Lawrence Livermore Lab

Caveats and Introductions

- I am not an expert in diffraction.
  - So why am I talking?
    - Better question: why are you listening?
    - Very little thought on diffractive capabilities among PHENIXians
    - I was an interested ‘volunteer’
- This talk will consider:
  - PHENIX detector specifics
  - PHENIX DAQ details
  - Review of 1st pp and 2nd AA runs
  - Capabilities for diffraction measurements with PHENIX
    - Now
    - After upgrades already in progress
    - With even more upgrades

Documents 1 - 10 of 41 matches. More ☆'s indicate a better match.

Diffraction at RHIC Workshop (fwd)☆☆☆☆

[Date Prev][Date Next][Thread Prev][Thread Next][Date Index][Thread Index] **Diffract**
news-l@bnl.gov> * Subject: **Diffraction** at RHIC Workshop (fwd) * From: Brant Johns
17:48:09 -0500 (EST) * Reply-To: phenix ...
http://www.phenix.bnl.gov/phenix/WWW/lists/phenix-news-l/msg01354.html 03/28/02,

Diffraction at RHIC Workshop (fwd)☆☆☆☆

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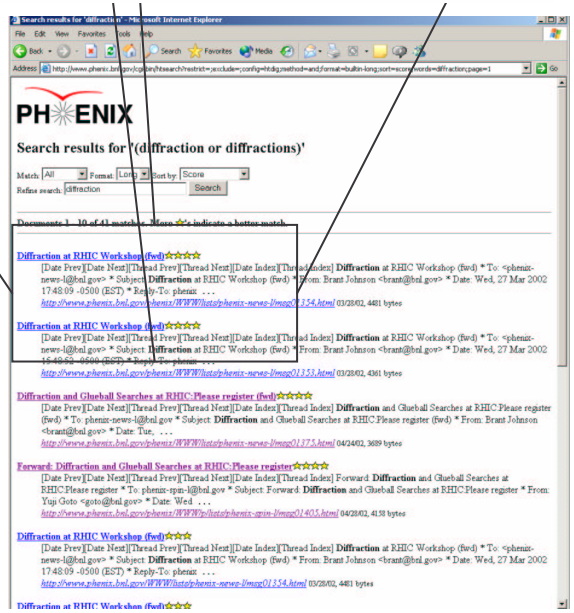
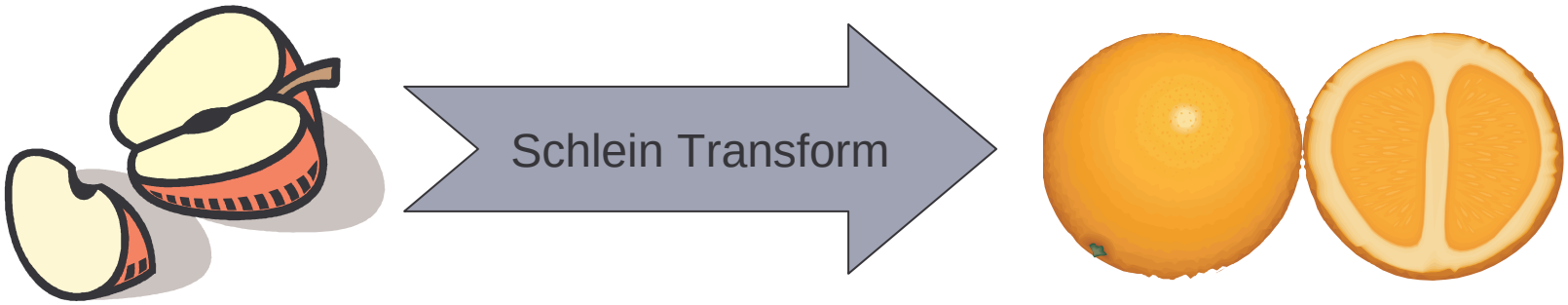


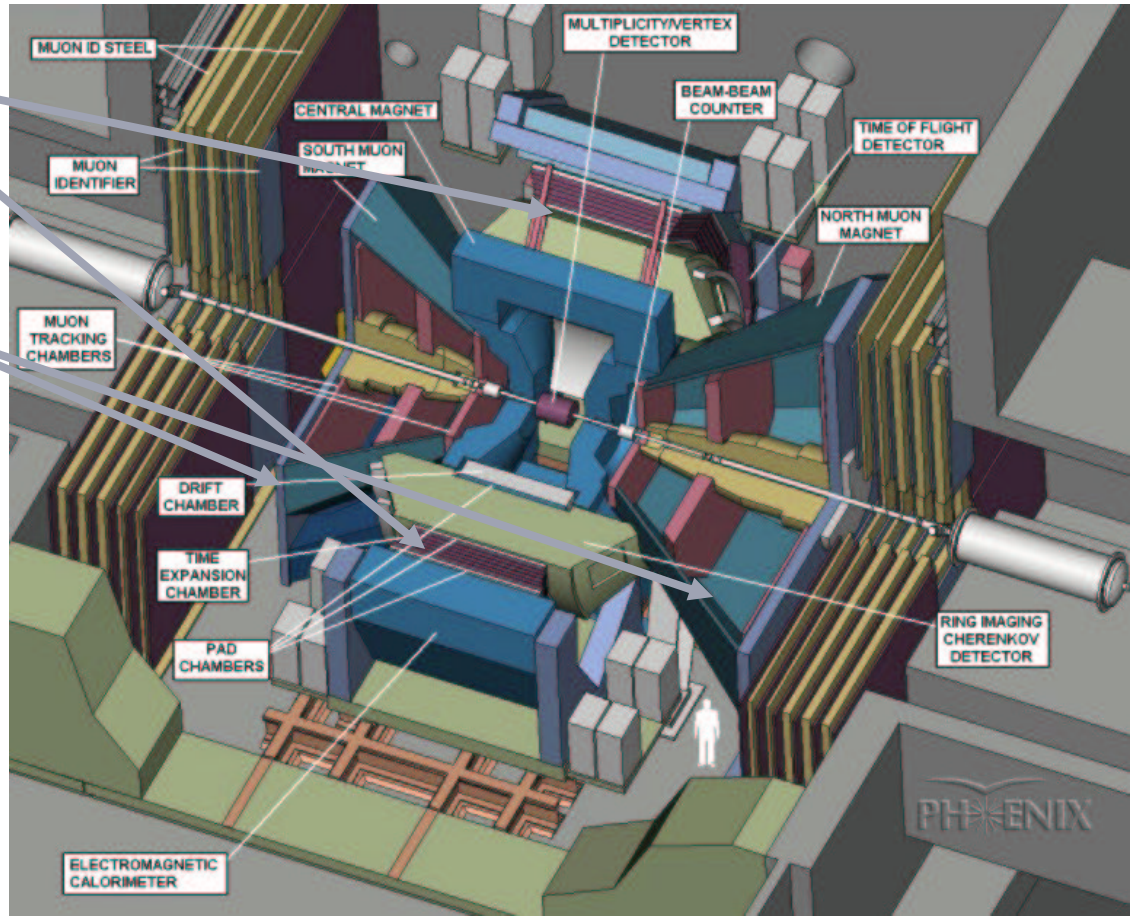
A few words

- PHENIX experiment was built to study rare probes from a QGP
  - Consistently in AA, pA, and pp collisions
  - And has been adopted to measure gluon spin distribution (ΔG) by our spin colleagues
  - Can we make diffractive measurements?
- Interesting to consider ... but



The PHENIX Detector (in simulation)

- Two “central” arms
  - Hadron
  - Electron
  - Photon
- Two “forward” muon arms
- 3 Global detectors
  - Forward nucleons (p,n)
  - Beam-beam counters
  - Silicon multiplicity (|η|<2.4)
- Designed as rare probe, high rate experiment for QGP characterization / spin observables



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- Two “central” arms
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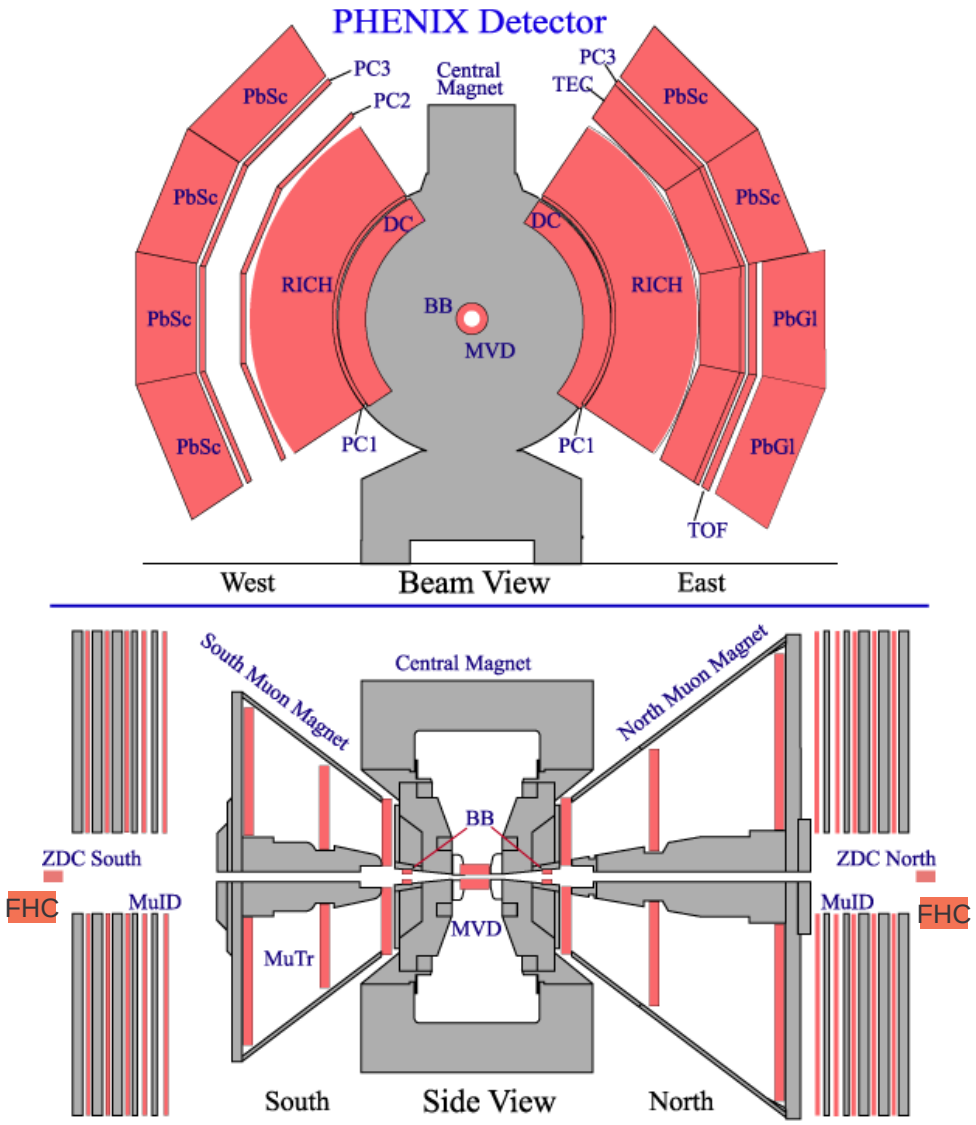
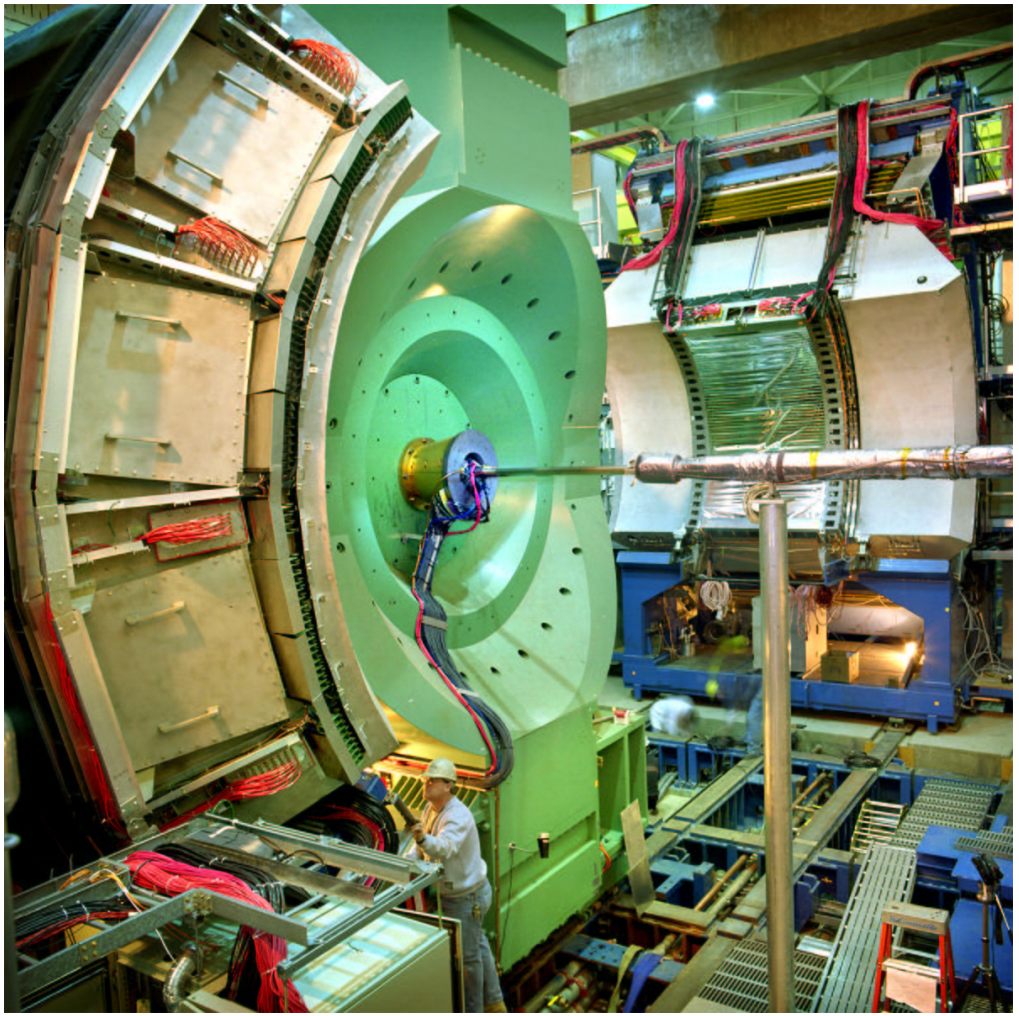
  - Silicon multiplicity ($|\eta|<2.4$)
- Designed as rare probe, high rate experiment for QGP characterization / spin observables (ΔG in pp and pA).

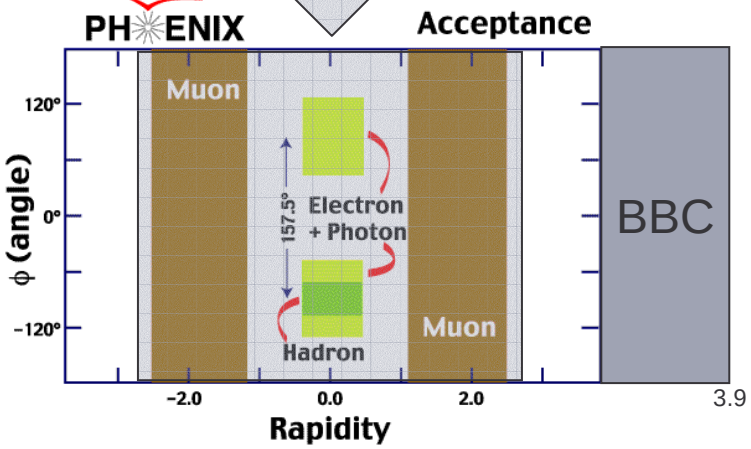


In reality

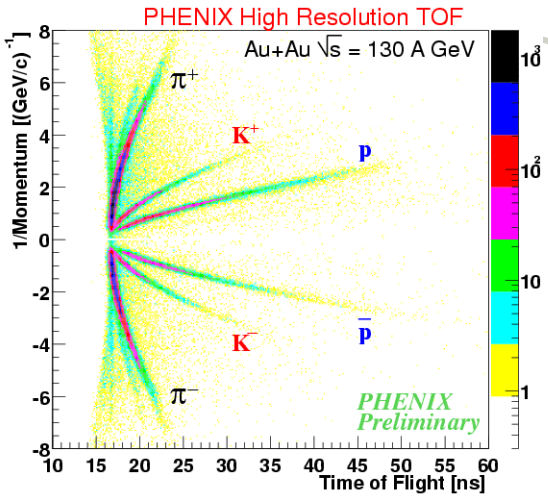
Acceptance



Nominal MVD/Si upgrade coverage



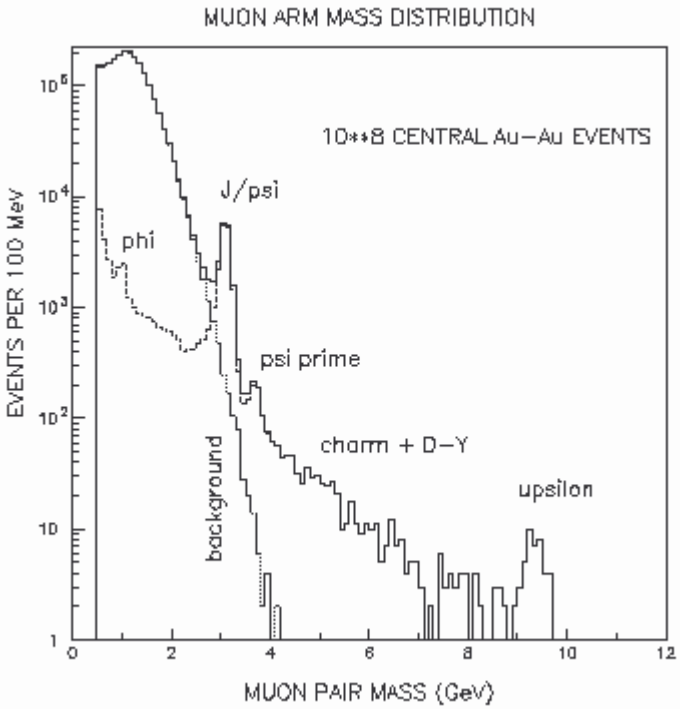
Particle identification



In Year 1:

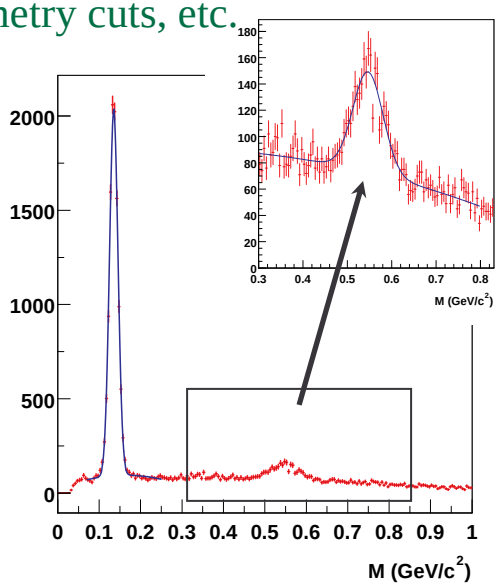
$$\frac{\partial p}{p} = 0.6\% \oplus 3.6\% \, p$$

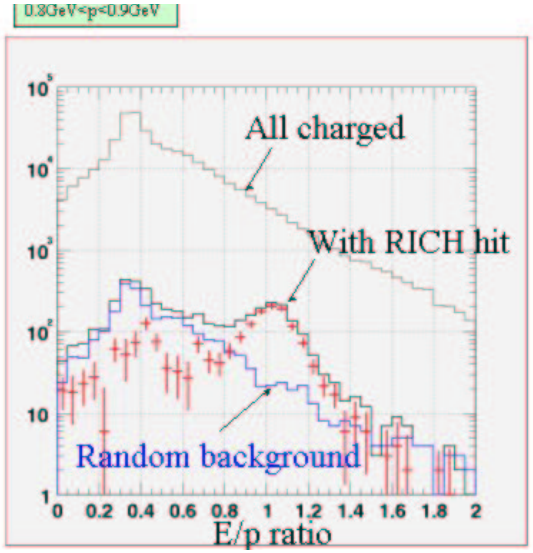
Expected dramatic improvement in Year-2



$p_t(\gamma\gamma) > 3.5$ GeV/c

With asymmetry cuts, etc.





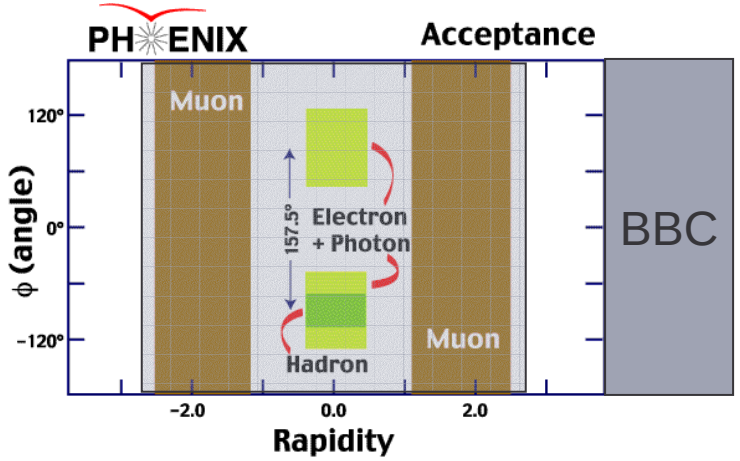
- Electrons are identified by RICH and EMCAL
- A clear peak in energy/momentum (E/p) ratio is seen at 1.0 after RICH hit is required
- EMCAL E/p cut cleans up the rest of the background.
- Random background is also subtracted by an event mixing method

A brief run history

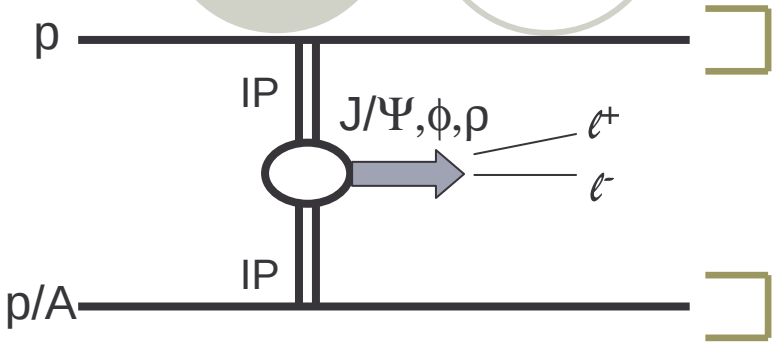
- RHIC recently completed it's 2nd run
  - Second AuAu run
    - Recorded: 24μb^{-1}
    - Max 1600Hz trigger rate, processed 800 Hz
  - First pp run
    - Recorded: .15pb^{-1} (most in final two weeks)
    - Max 22kHz trigger rate ç all processed at LVL-1
    - No prescaling of core physics triggers
- Pocket numbers:
  - PHENIX LVL-1 can process maximum RHIC rate (12 MHz in pp)
  - FEM/DCM max bandwidth limitation: 12.5kHz
    - Write to tape rate has event size dependence: Central AuAu @ ~60 Hz, etc.
  - Triggers:
    - Electron pairs, high p_t, γ/π^0, coherent peripheral, etc.
    - The DAQ processed these triggers at 1kHz rate in year-2

Diffractive musings

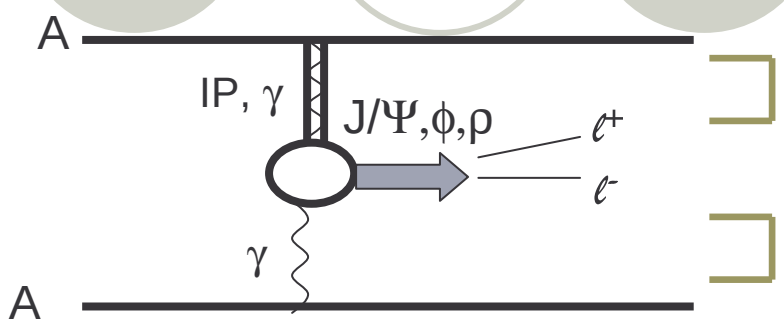
- (Current) PHENIX ==
  - high rate
  - e/μ/γ, high p_t specialty
    - Leading particles
  - Global detectors
    - Multiplicity Vertex Detector: $|\eta|<2.4$
    - Beam-beam counter: $3.0<|\eta|<3.9$
    - Zero degree calorimetry(2): forward (beam) p/n
  - Partial acceptance, especially at large rapidities
    - Rapidity gap not cleanly definable
    - Jet cone difficult to reconstruct
    - No forward proton detection in pp collisions



Possible measurements next run

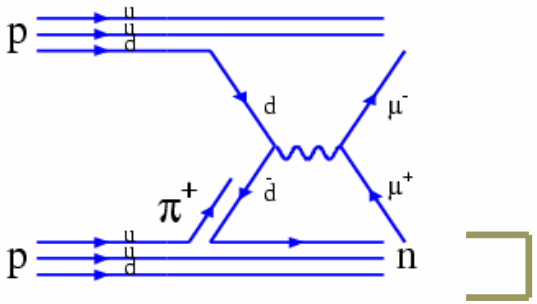


IP-IP interaction



Coherent peripheral interaction
(triggering code already exists)

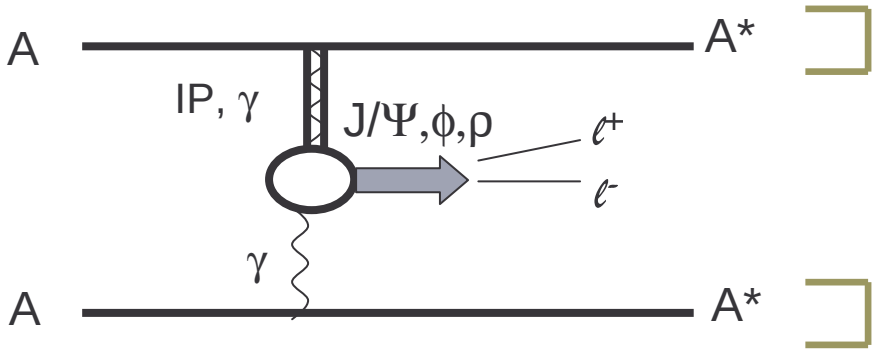
Tagged Drell-Yan production at RHIC?



One can tag on forward-going proton, neutron, Δ, Λ in coincidence with lepton-pair detection

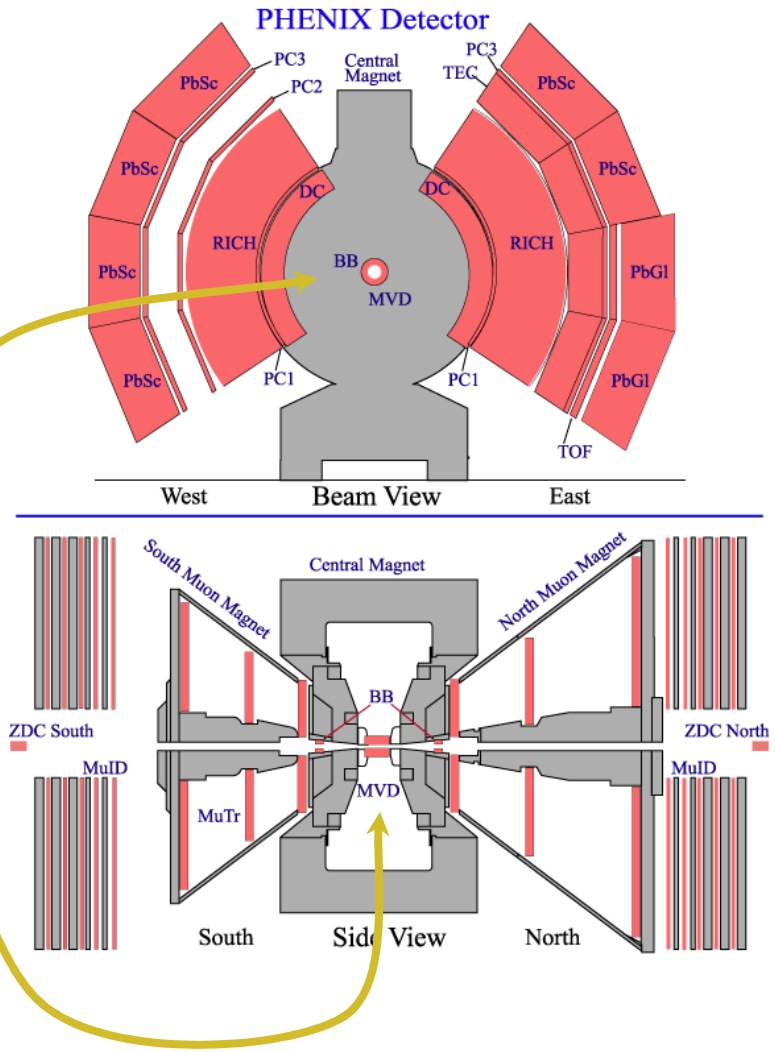
Probe anti-quark distribution of meson cloud

Courtesy: Jen-Chieh Peng



Additional capabilities with upgrade(s)

- The addition of Roman Pots would greatly increase the diffractive physics reach of PHENIX (all RHIC experiments)
  - Is anyone considering this upgrade? (STAR: yes; anyone else?)
- Other upgrade considerations by PHENIX (τ~3 years)
  - Hadron blind detector
    - Increased dalitz rejection for LVM
  - Inner tracker (TPC?)
    - Increased η,ϕ coverage Ł gaps and jets
  - Upgraded silicon detector (B-decays…)



Conclusions

- Overview of PHENIX experiment
- Possibilities of diffractive measurements with current detector
  - With upgraded detector
- My naïve conclusions:
  - Some interesting physics available
    - Unique capabilities of PHENIX
  - Is not a perfect fit …