Ultra-Peripheral Collisions

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- Physics in 2000-2001
- Physics prospects till 2004
- RHIC II Assumptions
- γA
- $\gamma\gamma$
- A new detector?

Physics 2001

- Topology Trigger
  - ~ 10,000 ρ^0
    - 50 X year 2000 sample
- Minimum Bias Trigger
  - ~ 4,300 ρ^0
    - 10 X year 2000 sample
- FTPC
  - forward tracks

- Physics:
  - ρ^0 cross sections
    - $\sqrt{s}$ scaling
  - ρ^0 interference
    - wave function collapse
  - $f_2(1270)$?
    - $\gamma\gamma$ produced resonance
  - J/Ψ - handful of events ?
  - e^+e^- pairs
  - 4-prongs
    - $\rho^*(1450/1700)$
      - spectroscopy
      - absorption

2002 -2004 Prospects

- BBC (+ MWC?)
  - ~ X5 trigger purity
- Higher Luminosity
- More selective min-bias trigger
- Hope for 10X data
- calorimeter in trigger
  - final states with neutrals
  - high efficiency J/ψ (?)
- MWC (?): can be used as veto and positive trigger

- Physics (partial list)
  - $\rho^0 \rho^0$
    - correlated production
  - J/ψ, ψ'(?)
    - gluon shadowing
  - meson spectroscopy

RHIC II assumptions

- 40x luminosity
- Fast readout
  - >> few Hz UPCs to tape
- Improved Particle ID
  - TOF
  - Microvertex detector
    - open charm
  - full calorimetry

γA at RHIC II

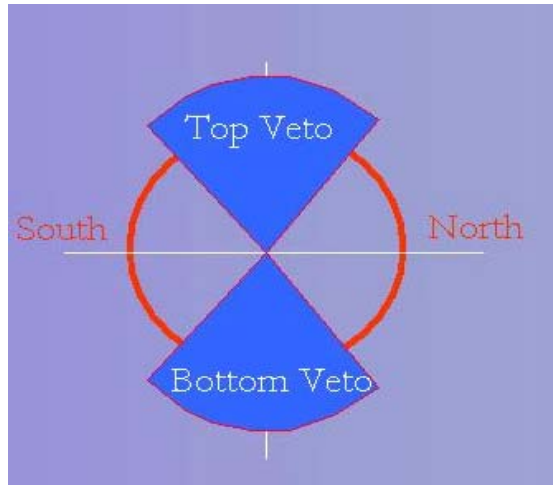
- $\rho^0 \rho^0$
  - correlated (stimulated) decay
- $\rho^0 \rho^0 \rho^0$
- high statistics J/ψ, ψ'(?)
  - high statistics gluon shadowing
- Υ production(with lighter nuclei)
  - shadowing at higher Q^2
- meson spectroscopy
  - search for exotic ($J^{PC}=2^{-+}$) mesons
  - search for charm hybrids (ccg)
  - study vector meson-nucleon interactions
- photo-production of open charm
  - Gluon shadowing

$\gamma\gamma$ at RHIC II

- meson spectroscopy
  - search for exotic mesons (STAR Note 243)
  - charmonium spectroscopy (η_c χ_ss, etc.)
  - search for charm hybrids ($c\bar{c}g$)
- $\gamma\gamma$ → baryon pairs ($\Lambda\bar{\Lambda}$, etc): baryon form factors
- $\gamma\gamma$ → $\tau^+\tau^-$:decay angle correlation, EPR paradox studies
- $\gamma\gamma$ → $c\bar{c}$
  - surprisingly, k factors are small and controlled for this reaction
  - requires compete DD reconstruction (low efficiency)
  - measurement of charm quark mass

Triggers Used

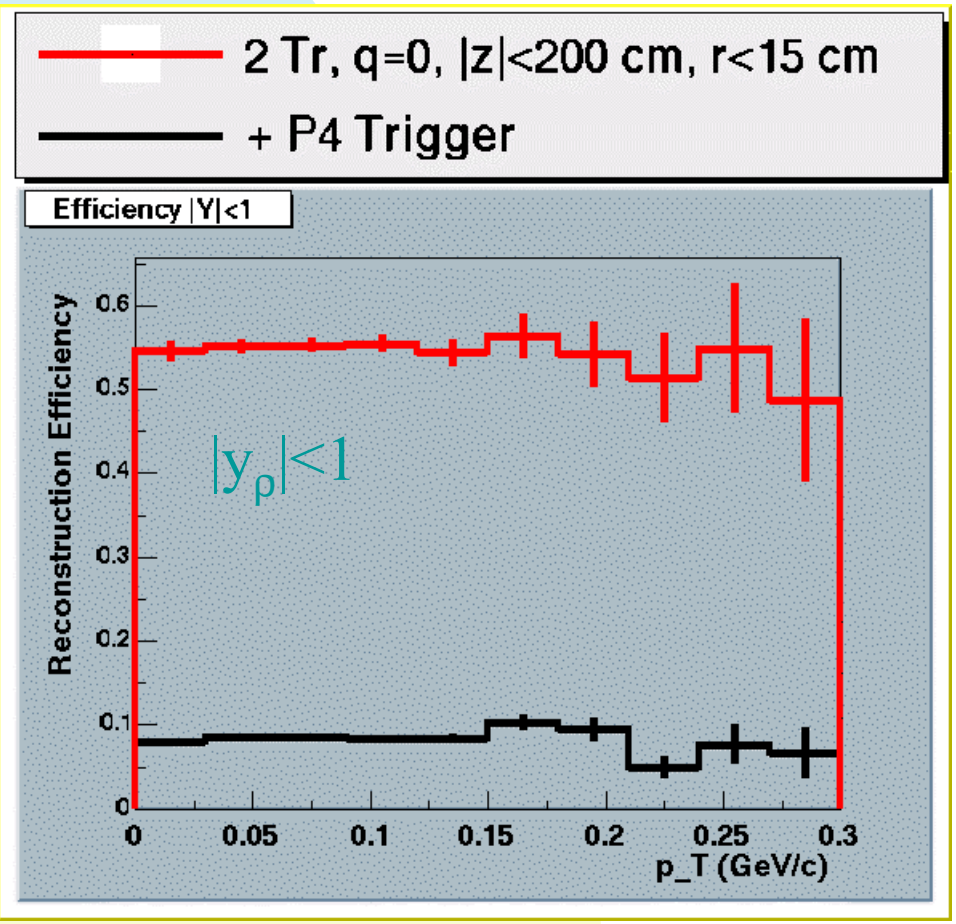
- L0
  - Minbias (ZDC coincidence): AA➔ A*A* X, X=ρ, ee, f_2,….
  - Topological: Coincidence in North-South CTB (no requirement in ZDC). Mainly AA➔ AA X. Low efficiency (10% for ρ) and very noisy ~1/500
  - Topological with ZDC: Very clean but very low efficiency
- Topology trigger used with L3

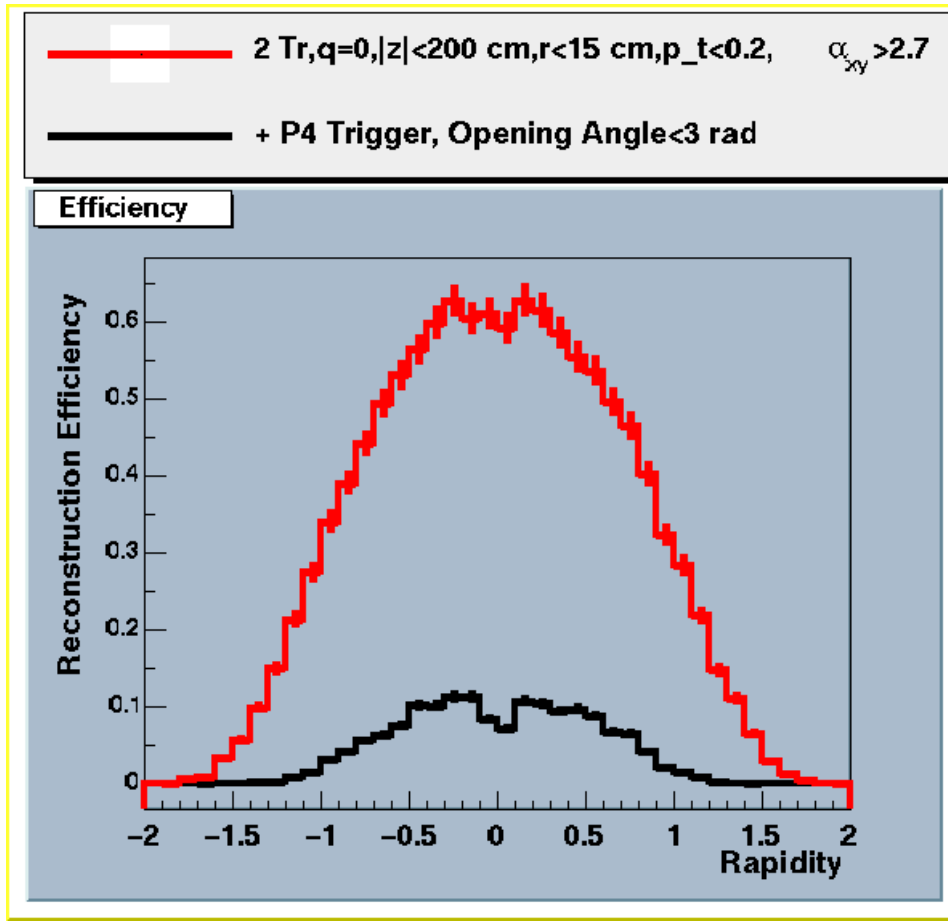


Improving trigger will have a great impact

ρ p_T and y Acceptance and Efficiency

From ρ MC sample





A New Detector?

- A Detector able to trigger and see low p_T tracks would be beneficial for UPC.
- SVT could bring the p_T cutoff. Could a detector trigger in that area? SVT? A Scintillator Fiber Barrel?
  - ee is seriously limited by low acceptance
  - Final states with low Kaons will improve ($\phi \rightarrow$ KK)
  - Background rejection: coincidence CTB and small radius fast detector

Conclusions

- UPC can greatly benefit from high luminosity
- A detector to trigger low p_T tracks could greatly enhance topology trigger and some areas of the program (ϕ,e^+e^-).
- Completion of current upgrades (EMC, TOF, microVertex) would open new channels.