Soft Physics

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SUMMARY

- Lots of good Physics
- Much needs upgraded STAR more than upgraded RHIC $\mathcal{L}$ (but not all)
- Need a better name!

  Soft Physics is
  Really Hard

Two measurements which directly probe the collisions: - Only in STAR
- But are difficult

Parity Violation: "The smoking gun"
- Needs A LOT of "ordinary" events.
- High Rate DAQ
- LOTS of running
- Efficient means to acquire, store, analyze data

Open Questions - search for the best observable(s).

Direct γ by HBT unambiguous yield of direct γ, works even at low P_T + you get all that HBT stuff (R_{out}, R_{side}, R_{long} ...)
- All 4 points above
- Good γ measurement

Open Question - is pair spectrometer required - or "just" a really good
- [illegible]

Open Charm

- Clearly important to know c quark density in collisions
- Can probably get yield from mixed events (few $\times 10^7$ events)
  B. Mueller (+others) - spectra, participation in Flow is interesting
- ToF PID will help
  (open question - how much)
- μ Vertex will help a lot
  (open question - detailed simulation).

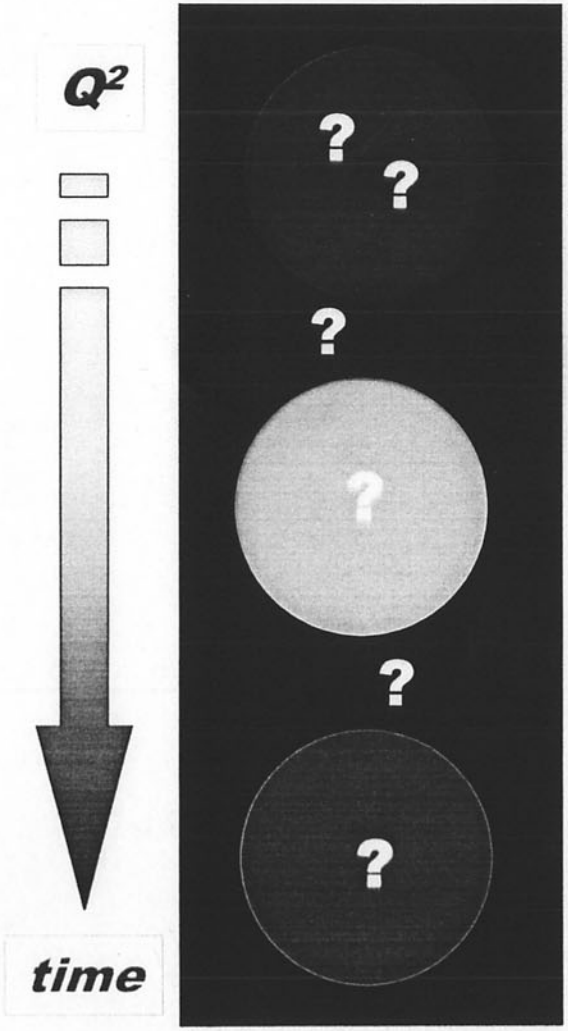
PHENIX is planning a "Fast track" to μ Vtx — ~~are~~ will (should-can) STAR be competitive?

Partonic Collectivity and Multistrange Baryon Flow.

Spectra, v_2, unlike particle correlations of m.s. baryons and heavier quarks probe earlier into collision.

Need ~10^8 events x number of "slices"

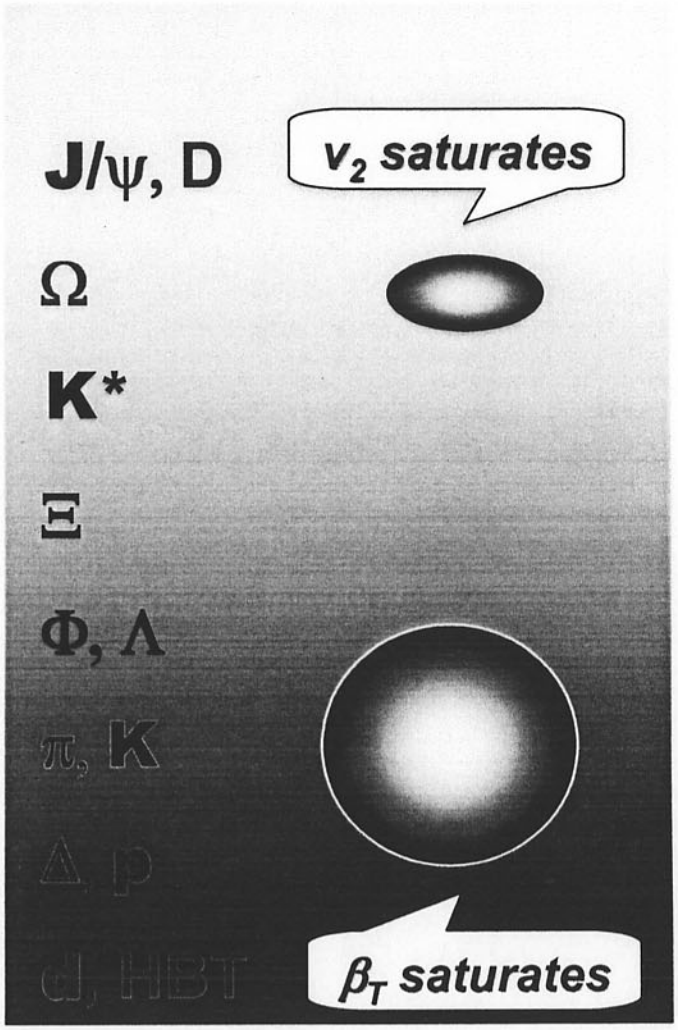
Introduction



1) *Initial Condition*
- *baryon transfer*
- *E_T production*
- *partons dof*

2) *System Evolves*
- *parton/hadron expansion*

3) *Bulk Freeze-out*
- *hadrons dof*
- *interactions stop*



Upgrade issues

1) Fast Data Acquisition

2) TOF barrel

3) SVT: increase V^0 efficiency by a factor of 2-7

Lots of heavy ion beam !

Exotica and Rare Signals:

- Anti nuclei $\bar{d}$, $\overline{Li^6}$ - may be triggerable
- Anti hypertritium ($\rightarrow \overline{He^3}\,\pi^-$)
- Dibaryons H^0, $[\bar{\Omega}\bar{\Omega}]$ ...
- Strangelets
- Glueballs, ...
- $n\bar{n}'$

— Need a lot of events

— Fast DAQ, μVertex for some.

UPC

- Improve Trigger Cleanliness
- μVertex allows charm studies
- J/ψ with Full Calorimeter.

→ New detector ~ at SVT outer Radius to trigger on low mult. interacti (and low p_t particles - $\phi \to KK$)

Summary of Upgrades:

- Fast DAQ (The whole chain!)
  *efficient acquistion, storage and <u>analysis</u>
- PID - TOF
  - μ Vertex
- - - - - Clean, efficient γ detection (upgrade calo.)
- One more open question:
  Fluctuations, correlations ...
  (direction, Future)