PEP-N Detector

(VERY PRELIMINARY)
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PEP-N

- asymmetrical $e^+e^-$ Collider
- $1.4 < \sqrt{s} < 2.5$ GeV
- 100X Ldt of ADONE, DCI
- accelerator cost $< 10M\$$
- comparable detector cost
Some Important Characteristics

- magnet -- O-O.6 Tm vertical B
  - must not disturb HER
- event rate -- <10 Hz
- backgrounds
  - 1 keV gammas from LER
  - beam-gas
Detector Requirements

- low mass tracking
- momentum measurement @ several %
- EM calorimetry
- luminosity measurement @ 2%
- n nbar
- some particle ID (is dE/dx enough?)
- modest cost
Some Issues

- n nbar with other physics? tentatively no!
- construction and running in phases? yes!
- existing detector elements?
  - PS170 magnet from CERN
  - E760 CCAL and FOCUS calorimeters from FNAL
  - U Virginia neutron counters from Jefferson Lab
Magnet

- PS 170 magnet
  - Adv: exists, particles do not pass through a coil, doesn’t disturb HER, easy installation.
  - Disadv: limited aperture, field non-uniformity.

- superconducting solenoid (<0.2 X,)
  - Adv: large aperture, uniform field, low operating cost.
  - Disadv: to be built, particles through the coil, more complicated detector installation.
Tracking

- ~1m diameter, 1m high cylinder
- low mass (He)
- high resolution, dense sampling
- dE/dx
- drift chamber (-BABAR) or TPC
Electromagnetic Calorimetry

- quality forward calorimetry
- basic backward calorimetry
- Pb glass is suitable and affordable
- pointing geometry desirable
- E760 CCAL, FOCUS, and other calorimeters are available.
Luminosity Monitor

- 2% - control of acceptance crucial
- Bhabhas < 5 degrees
- forward tracking (straws?) + Pb glass at 5m
- backward tracking - main tracking chamber
Neutron/antineutron Detector

- favorable kinematics
  - backward antineutrons (0.5-1.5 GeV/c)
  - forward neutrons >1.5 GeV/c, <33 degrees
- main tracking chamber + forward luminosity monitor
- plastic scintillators plus tracking for n nbar
Rough Costs

- Magnet: “C” magnet $100K-200K OR solenoid $320K
- new tracker: $780K
- refurbished EM calorimeters: $700K
- n nbar detector: $1300K
- DAQ: $250K
- luminosity monitor: nominal
- TOTAL: ~$3.5M + 100% contingency
Run Plan

- ~ 5 yrs 200 pb\(^{-1}\)
- Multihadrons: 1.4 2.5 GeV, -25 points
  - 30<\sigma<90 nb
  - 1-5 pb\(^{-1}\)/point -> 50-100 pb\(^{-1}\)
  - >50,000 events/point
- N NBAR: 1.9-2.5 GeV, -13 points
  - 0.4<\sigma<1.2 nb
  - 2-6 pb\(^{-1}\)/point -> 50-75 pb\(^{-1}\) (FENICE 0.4 pb\(^{-1}\))
  - >500 events/point
Other Machines (1 A-2.5GeV)

- ADONE, DCI (<4 pb⁻¹)
- BES >2 GeV (but L ~ 10²⁹ @ 2 GeV)
- VEPP4M 2 GeV possible at L~10²⁹
- VEPP2000 in construction
  - < 2 GeV
  - design L ~ 10³²
  - new technology (solenoidal focusing)