SANE
Spin Asymmetries on the Nucleon Experiment

TJNAF E-03-109

U. Basel, Florida International U.,Hampton U., Norfolk S. U., IHEP Protvino, Rensselaer Polytechnic I., Temple U., TJNAF, U. of Virginia, College of William & Mary, Yerevan Physics I.

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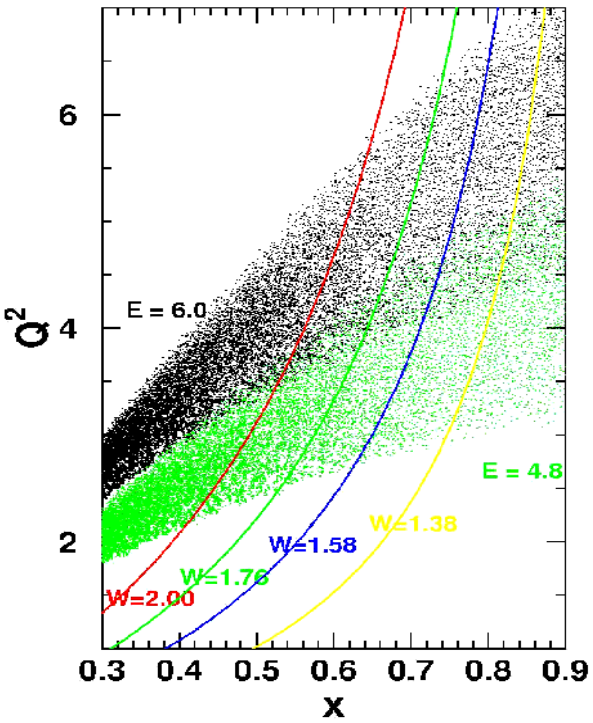
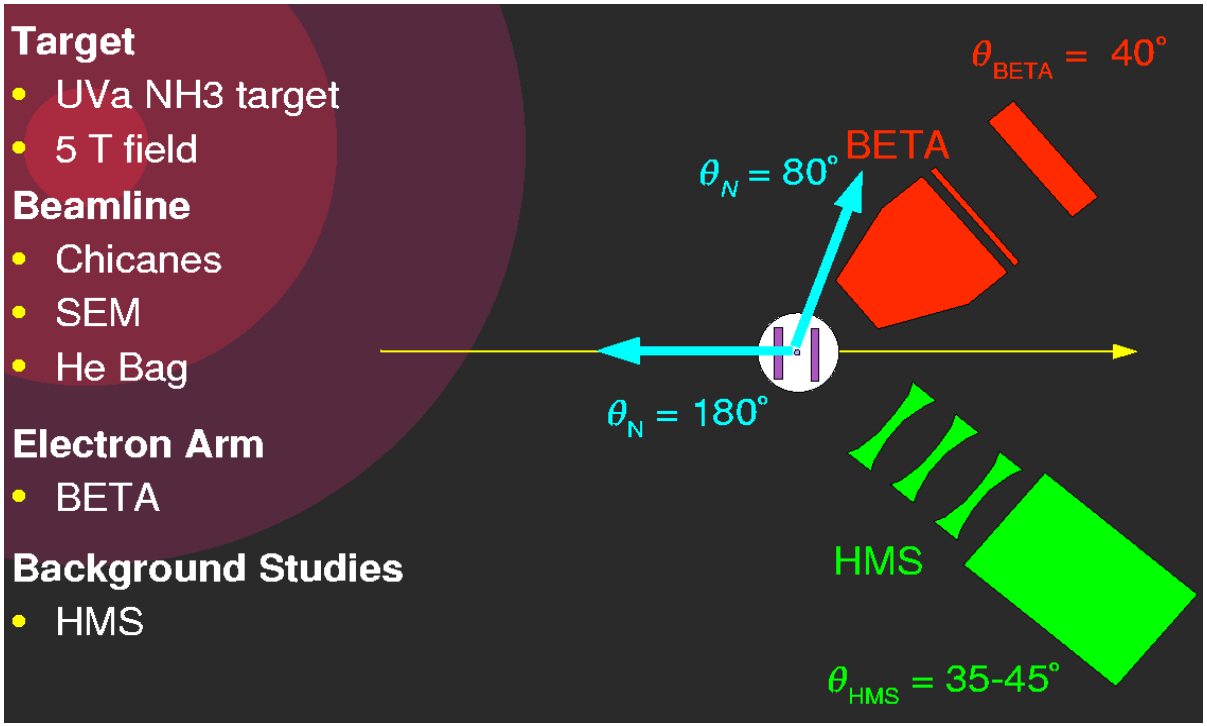
Physics:

- Measure proton spin structure function $\boldsymbol{g_2(x, Q^2)}$ and spin asymmetry $\mathbf{A_1}\,\boldsymbol{(x, Q^2)}$ at momentum transfer $2.5 \leq \boldsymbol{Q^2} \leq 6.5$ GeV^2 and Bjorken $\boldsymbol{x}$ $0.3 \leq \boldsymbol{x} \leq 0.8$
- Study x and Q^2 dependence, twist-3 effects, moments of $\boldsymbol{g_2}$ and $\boldsymbol{g_1}$, comparison with Lattice QCD predictions, test polarized local duality for $W > 1.4$ GeV,
- Detect electrons with large solid angle electron telescope **BETA**

SANE Kinematics and Layout

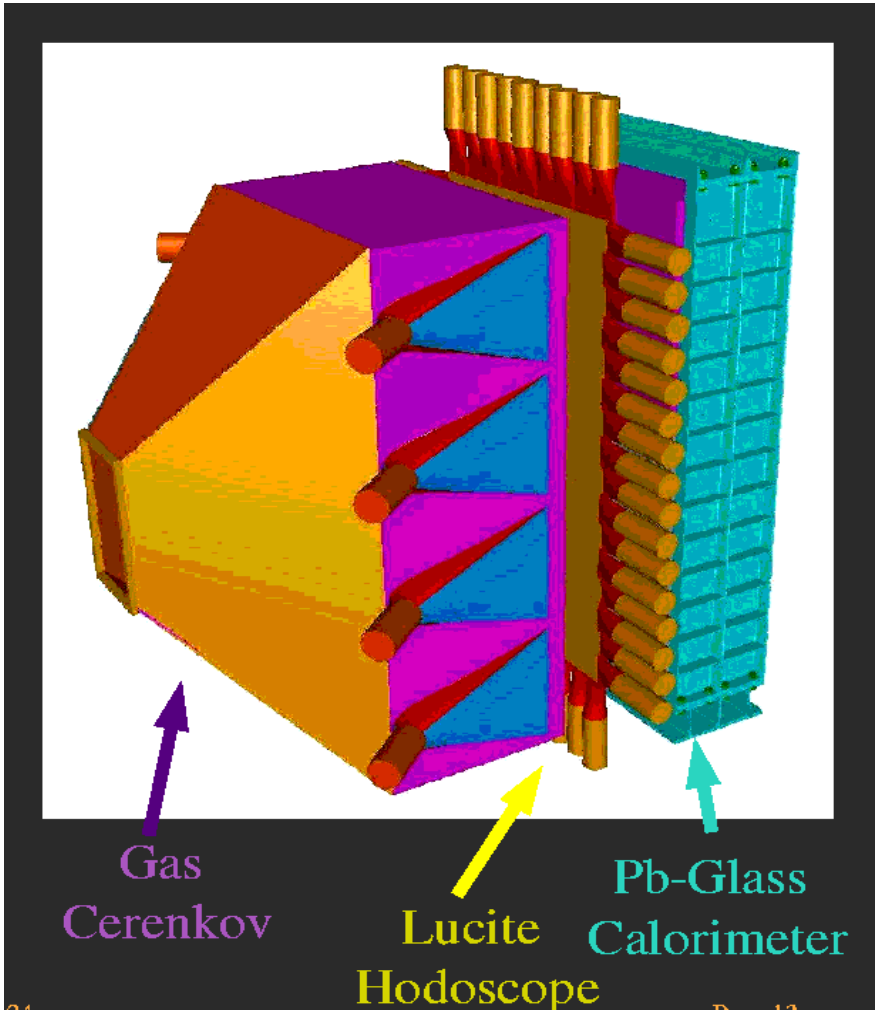




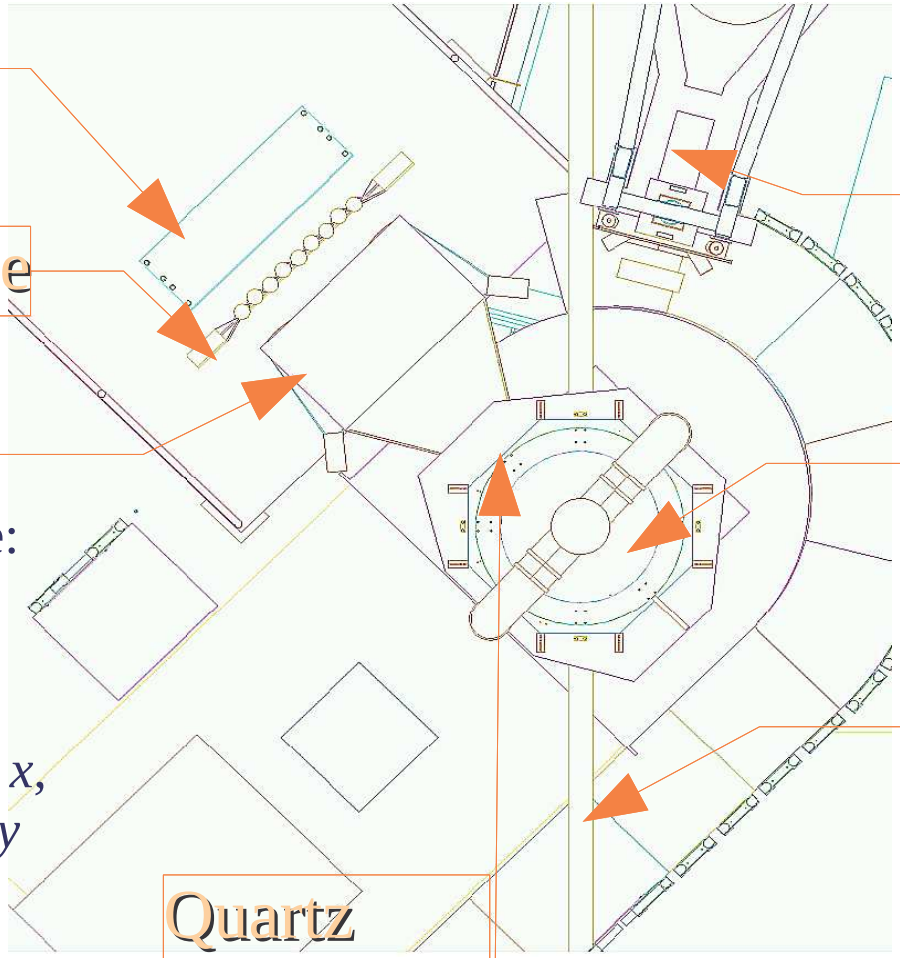
- Two beam energies:
  - 6 GeV (black), 4.8 GeV (green)
- Very good high *x* coverage
- Hall C

Big Electron Telescope Array - BETA

- Three subsystems:
  - BigCal lead glass calorimeter: main detector, being built for ***GEp-III.***
  - Gas Cherenkov (N): additional pion rejection
  - Tracking hodoscope (Cherenkov)
- Target field sweeps low *E* background
- Characteristics of *BETA*
  - Effective solid angle (with cuts) = 0.194 sr
  - Energy resolution 5%/$\sqrt{E}$(GeV)
  - angular resolution = 2˚
  - 1000:1 pion rejection



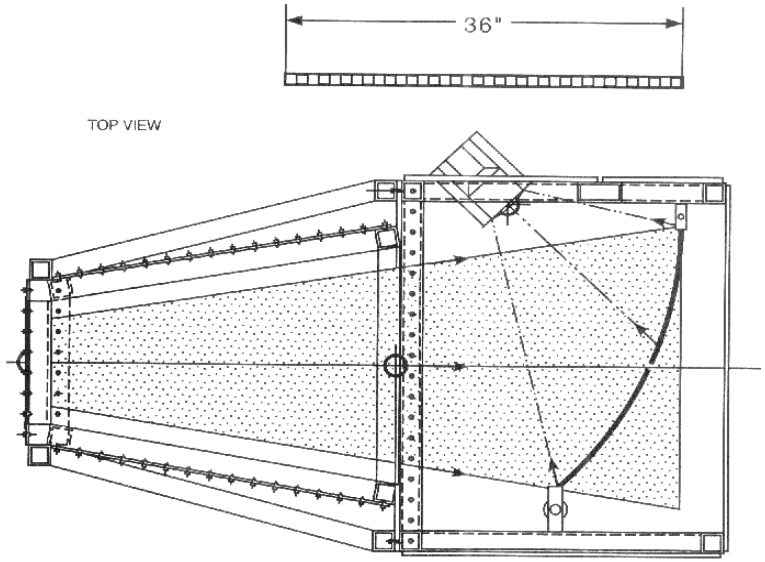
SANE Reference Design



- Lucite Hodoscope:
  - 16 *x* by 8 *y* hodoscope
  - 1.25 cm thick *x*, 2.5 cm thick *y*
- PMT at each end
- reflective wrap: 10 p.e.'s

SANE Status

- Four previous collaboration meetings (11/03, 3/04, 6/04 and 9/04).
- Three new collaborator groups since PAC: Florida International U., Norfolk State U., and second U. of Virginia group
- IHEP – Protvino collaborator to work on BigCal 6 mos. in 2005 being planned.
- Modular design of gas Cherenkov, with PMT's only on side far from beam
- Tests of prototype gas Cherenkov in Hall C (Brad S. report)
- Alternative design for tracking hodoscope (proposed by Peter B.)
  - Located next to target chamber
  - Quartz as Cherenkov material



SANE Status (II)

- Gain Monitor: bench tests of glass response to Lucite light at UVA
- Polarized target outer vacuum can design under way
  - windows number, locations and sizes
  - can dimensions
- Integrate can with
  - quartz hodoscope
  - *e-p* elastic calibrations
  - Semi-SANE
- Hall C schedule (Rolf E.): SANE tentatively to run in 1st. half 2007, followed by Semi-SANE
- Time lines show adequate lead time for installation in Fall 2006.
- SANE Web site
  - http://www.jlab.org/~rondon/sane/

SiPM's spectral response

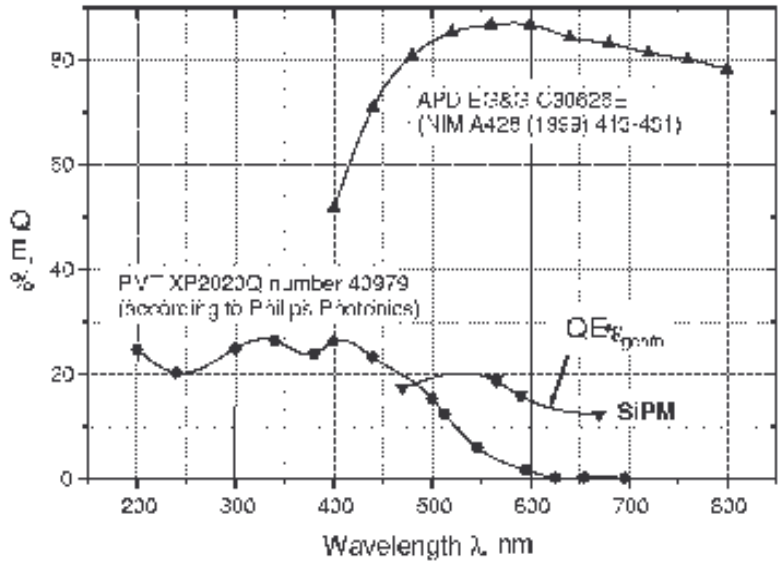
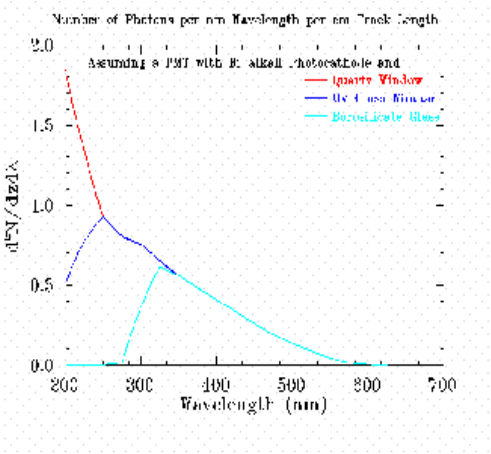


Fig. 2. Comparison of photon detection efficiencies for PMT [4], APD [5] and SiPM.



PMT Window	Maximum pe's/cm ($200\ \text{nm} < \lambda < \infty$)	Maximum pe's/cm ($400\ \text{nm} < \lambda < \infty$)
	Quartz Bar	"UVT Lucite Bar"
Quartz	198	32
UV Glass	167	32
Borosilicate Glass	88	32