

Spin Asymmetries of the Nucleon Experiment - SANE (TJNAF E07-003)

PHYSICS: **proton** spin structures $g_2(x, Q^2)$ and $A_1(x, Q^2)$ for $2.5 \leq Q^2 \leq 6.5 \text{ GeV}^2$, $0.3 \leq x_{\text{Bj}} \leq 0.8$

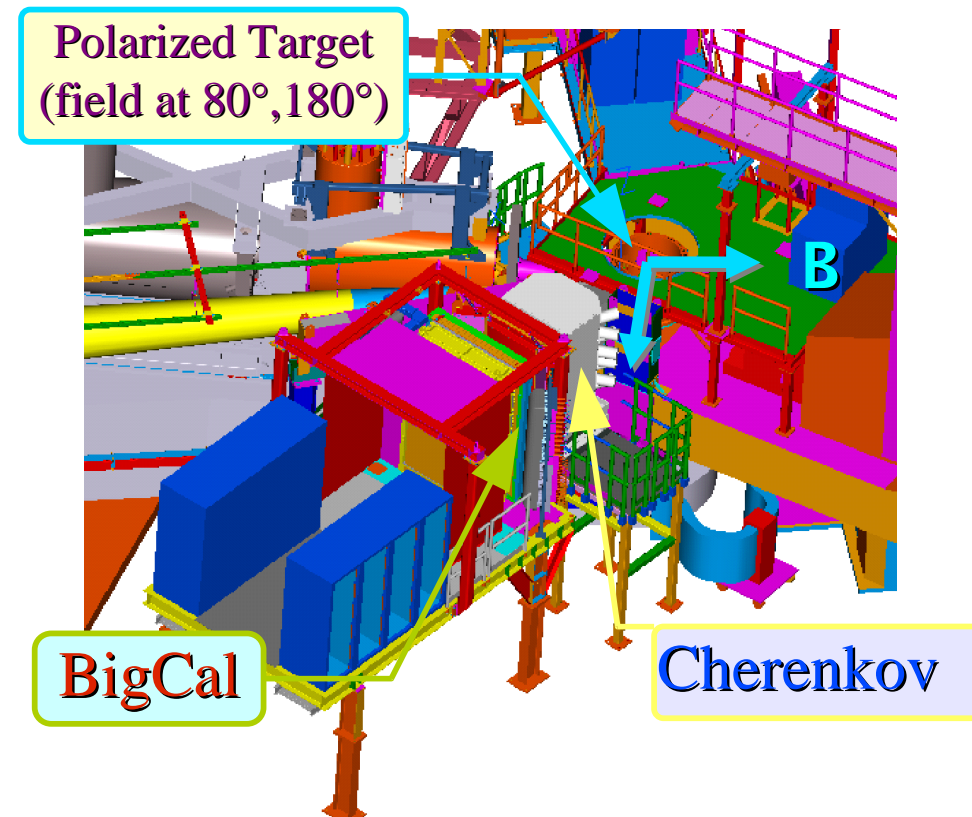
Measure inclusive double polarized asymmetries to:

- access *quark-gluon* correlations using LO twist-3 effects (OPE d_2 quark matrix element)
- compare with Lattice QCD, QCD sum rules, bag model, chiral quarks
- test nucleon models (x dependence) and Q^2 evolution
- explore $A_1(x \rightarrow 1)$; test polarized local duality

DOE 2011 Milestone for proton spin structure

METHOD:

- **CEBAF 4.7 & 5.9 GeV polarized electrons**
- **Solid polarized ammonia target**
- **BETA**: novel large solid angle (0.2 sr) electron telescope:
 - Big Cal Calorimeter + gas Cherenkov + Tracking



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- Took data in **Hall C** Jan. - March 2009
- Measured single arm double polarized asymmetries at 80° and 180° beam-field angles
- Collected about
 - 70% of proposed data at 80° , 35% at 180°
- Early results of BETA spin asymmetries and structure functions presented at [APS Spring 2012](#)
 - Sample results for $W > 1.9$ GeV, $E' > 1.3$ GeV
- Ongoing:
 - improving systematics; moments calculation; extending x range below 0.3
- SANE also took:
 - HMS-BETA e - p elastic coincidence and single arm elastic data for proton G_E/G_M .
 - HMS single arm inelastic asymmetries
- Two Ph. D. thesis defended, four in progress.

