

PAC52 and SBS

PAC52 Recommendations

NUMBER	TITLE	HALL	DAYS REQUESTED	DAYS AWARDED	SCIENTIFIC RATING	PAC DECISION	TOPIC
New Proposals							
PR12-24-001	Measurement of the Nuclear Dependence of σ_L/σ_T in Semi-Inclusive Deep Inelastic Scattering	C	5	7	A-	approved	5
PR12-24-002	Exploring the Transition Region of QCD with the Proton's g2 Spin Structure Function	C	26			C2	4
PR12-24-003	Studying Lambda interactions in nuclear matter with the $^{280}\text{Pb}(e, e' K^+)(^{208}\text{Lambda})\text{TI}$ reaction	C	42	42	A-	approved	5
PR12-24-004	Study of charge symmetry breaking in p-shell hypernuclei	C	24	24	A-	approved	5
PR12+24-005	A Dark Photon Search with a JLab positron beam	B	55	55	A-	C1	0
PR12-24-006	GlueX-III: a path to the Luminosity Frontier in Hall D	D	200	200	A	approved	1
PR12-24-007	Nuclear Dependence of Beam Normal Single Spin Asymmetry in Elastic Scattering from Nuclei	C	9	9	A	approved	0
PR12-24-008	Inclusive Studies of 3N Short-Range Correlations	C	57			deferred	5
PR12-24-009	Exclusive electro-disintegration of tensor polarized deuterium	C	86			withdrawn	5
PR12-24-010	High-precision measurement of $\mu_p G_E^p/G_M^p$ at $Q^2 = 3.7 \text{ GeV}^2$ via Polarization Transfer	A	2	2	A-	approved	2
PR12-24-011	Study of a triaxially deformed nucleus using a Lambda particle as a probe	C	28	28	A-	approved	5
PR12-24-012	Isospin structure of 3N short-range correlations and the nucleon structure functions in ^3H and ^3He	C	53			deferred	5
PR12-24-013	An isospin dependence study of the Lambda-N interaction through the high precision spectroscopy of Lambda hypernuclei	C	62 (55)	55	A-	approved	5

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Weak Axial-Vector Form Factor

Motivation: This LOI proposes to measure the axial-vector form factor of the nucleon using the reaction $H(e^-, n)\nu_e$. Most of the existing experimental measurements of this form factor come from neutrino scattering experiments with wide-band beams and often with nuclear targets. In contrast, the uniqueness of the proposed measurement is that it will use a mono-chromatic (known) beam and a nucleon target. Knowledge of the axial-vector form factor is becoming increasingly important for precision accelerator-based neutrino oscillation experiments, especially for those that compare neutrinos and antineutrinos.

Measurement and Feasibility: The request is for 25 days of electron data-taking at 2.2 GeV on a liquid hydrogen target in Hall C. For the detector, the proposal is to use the electron/pion arm from the existing SBS magnet, the SBS GEM chambers, and the lead-glass electromagnetic calorimeter that is currently under construction for the Gep experiment E12-07-109, which will run in 2025. The rest of the experimental needs will require new investment.

Given that the neutrino signal being probed is ~ 7 - 8 orders of magnitude smaller than the elastic electron scattering and pion photo-production reactions, the proposed measurement requires significant strategies for background rejection ($\sim \times 10^4$ rejection for the e-p process). While the precision of the measurement will depend strongly on the success of such background rejection, even an initial measurement of $G_A(Q^2)$ at twice the quoted precision would be valuable, given the dearth of existing experimental data.

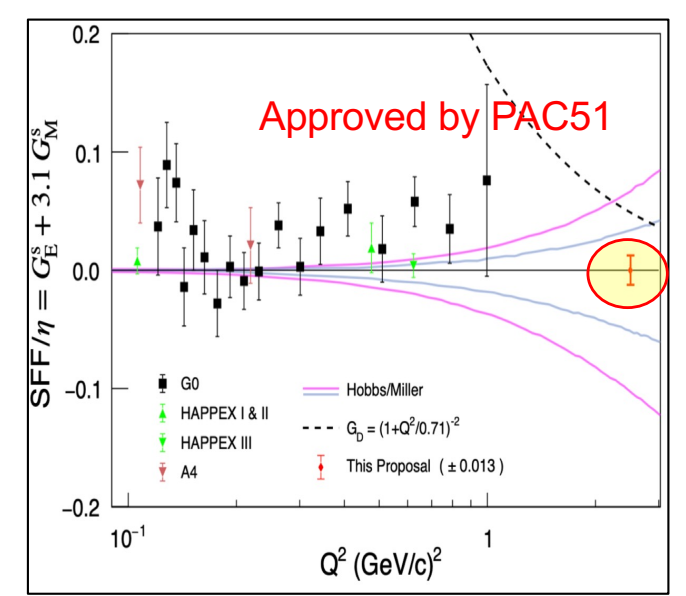
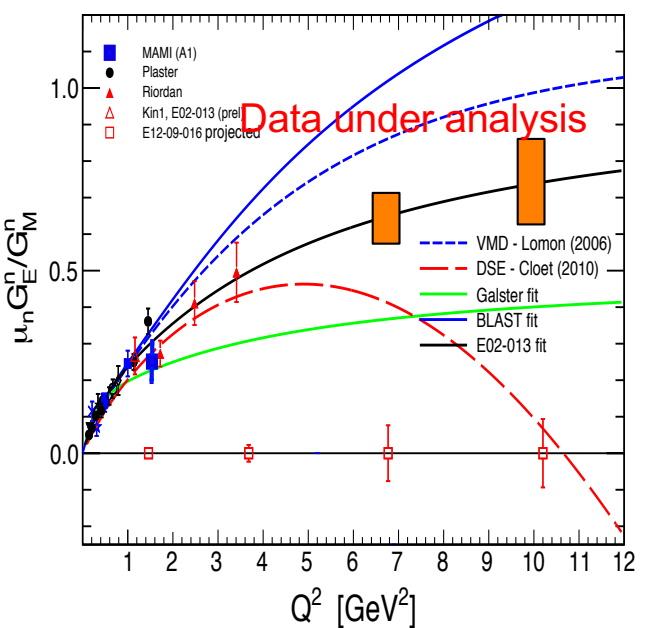
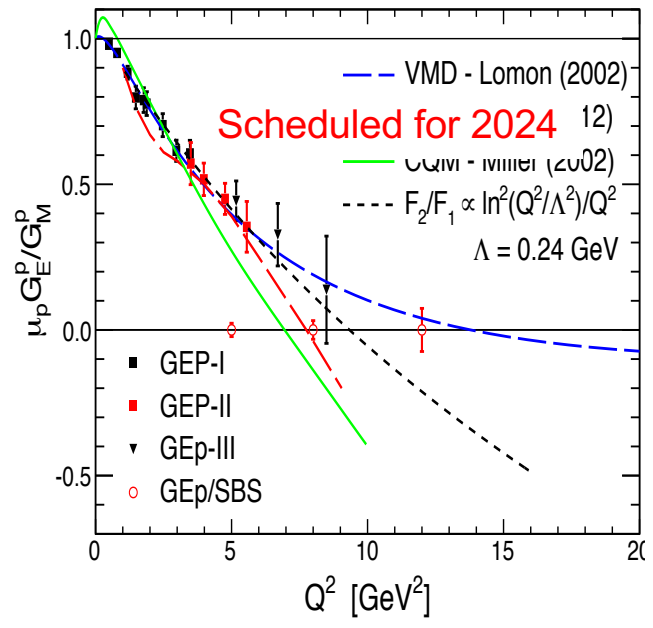
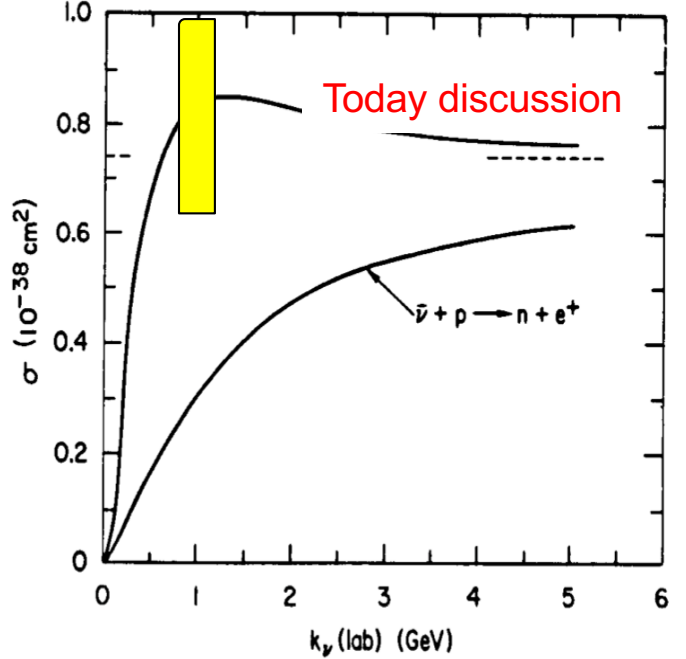
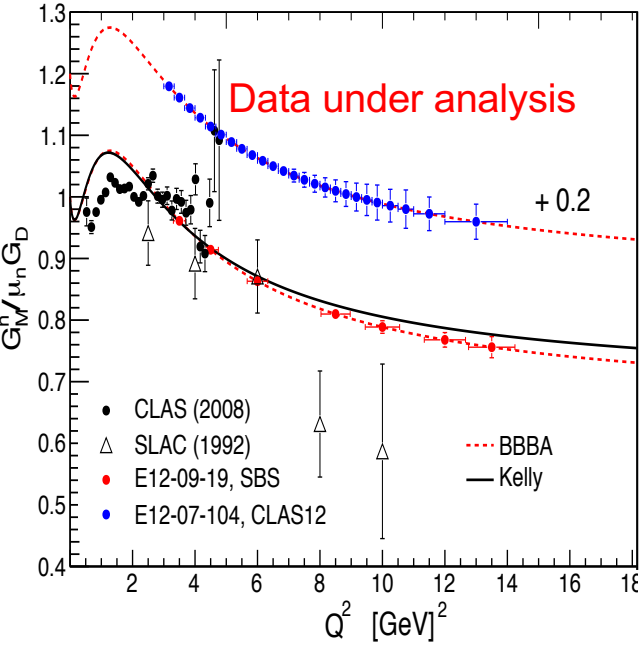
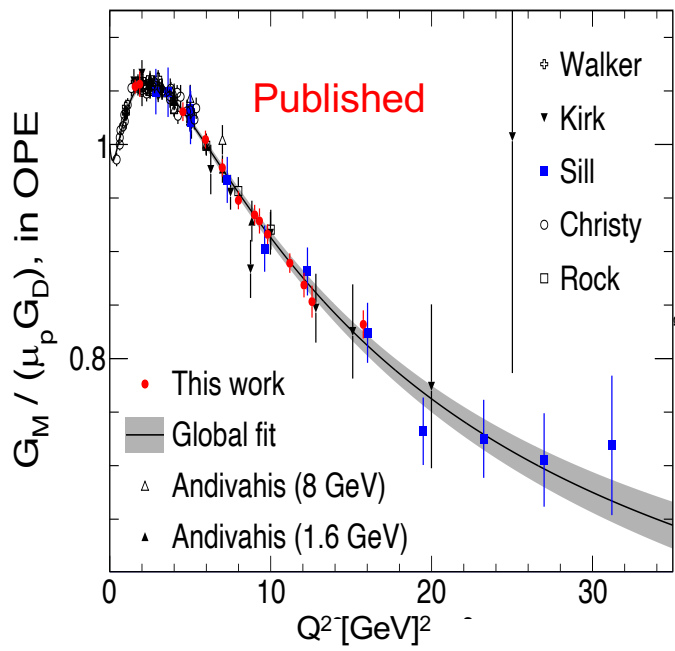
Issues: The LOI is short on detail and lacking in physics plots. Overall, the proposal needs a more detailed description of the measurement itself, the associated theory, and the detector setup that will be used. A full simulation and description detailing the strategy for background rejection will be critical content for a full proposal. A plot of the planned accuracy of the axial-form factor measurement compared to existing measurements should be produced. It will also be important to tabulate to what extent existing vs. new experimental equipment will be required to carry out the planned measurement.

Summary: This LOI offers a unique opportunity to measure the axial-vector form factor (the least well-known nucleon form factor) in a very different manner than is commonly probed in neutrino scattering. Such a measurement is of considerable importance for accelerator-based neutrino oscillation experiments. The PAC encourages the proponents to proceed to a full proposal after the above issues are addressed. The PAC encourages the use of a full Monte Carlo simulation to assess detector performance, background levels, and systematic uncertainties. If this method of extracting the axial-vector form factor proves successful, the PAC notes that this could become part of a larger measurement campaign. In particular, a measurement of the Q^2 dependence of the axial-vector form factor would be of great interest to the neutrino scattering community.

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The nucleon elastic FFs



SBS collaboration meeting 2024

September 12 (Thursday): 9am - 5pm in Auditorium

Session 1, moderator – Bob Michaels

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|---|-----------------------------|
| 9:00 Open remarks | 10' - Bogdan |
| 9:10 Hall A plan for GEp | 15' - Mark |
| 9:25 Hall A design for GEp | 25' - Robin |
| 9:50 Physics of the nucleon Form Factors | 20' - Gordon |
| 10:10 GEp status: run plan/safety | 15'- Evaristo (zoom) |
| 10:25 GEp status: detector setup/students/manpower | 20'- Nilanga |
| 10:45 GEp electron arm, ECAL | 25' - Donald |
| 11:10 Break 20' | |
| 11:30 GEp electron arm, CDET | 20'- Peter |
| 11:50 Lunch | |

SBS collaboration meeting 2024

Session 2, moderator – Mark Jones

1:30 Overview/status of GMn/GEN analysis	40' - Andrew
2:10 GEN-RP/KLL analysis	20' - David*
2:30 GEM trackers lessons/status	30' - Holly/Nilanga
3:00 He-3 target lessons/status for SIDIS	30' - Gordon
3:30 Break 20'	
3:50' DAQ lessons/status	30' – Alex
4:20 HCAL lessons/status	20' – Jiwan

Session 3, moderator – Michael Kohl

- | | |
|---|----------------------------|
| 9:00 SBS layout in Hall C | 20' - Steve |
| 9:20 SBS in Hall C - physics to do: SIDIS | 20' - Andrew |
| 9:40 SBS in Hall C - physics to do: TDIS | 20' - Rachel (zoom) |
| 10:00 SBS in Hall C - physics to do: pol WACS | 20' - Gabriel |
| 10:20 SBS in Hall C - physics to do: sFF | 20' - Kent |
| 10:40 30' Break + Photo | |
| 11:10 New physics to do: Axial-vector FF | 20' - Jim |
| 11:30 More physics: Phi meson electro production | 20' - Charles |
| 11:50 Lunch | |

Session 4, moderator – Alex Camsonne*

1:30 Combined report from all GMn Ph.D. students 30' - Provakar

2:00 Combined report from all GEn Ph.D. students 30' - Hunter

2:30 Poster session

120'

**GMn analysis; nTPE analysis, GEn analysis, GEn-RP analysis,
KLL analysis; ECAL, TH, GRINCH, GEM, HCAL, SBS magnetics,
GEp soft; GEp layout; GEp target/beam; GEp SBS magnet/correctors;**

4:30 Collaboration Party in ResFac

3 h

September 14 (Saturday): 9am - 1pm in room L102

Session 5 (Axial-Vector Form Factor), moderator - Bogdan

9:00 Summary of LOI with key numbers

- Jim Napolitano

9:30 Weak interaction theory and neutrino physics

- Aaron Meyer

10:00 Neutrino recent experiment

- Michael Kordosky*

10:30 Detector technology for high resolution TOF

- Daniel Carman

11:00 Coffee break – 30'

11:30 The proposal for PAC53, scope, work to do

- Todd Averett

12:00 Current status of MC work

- Weizhi Xiong (zoom)