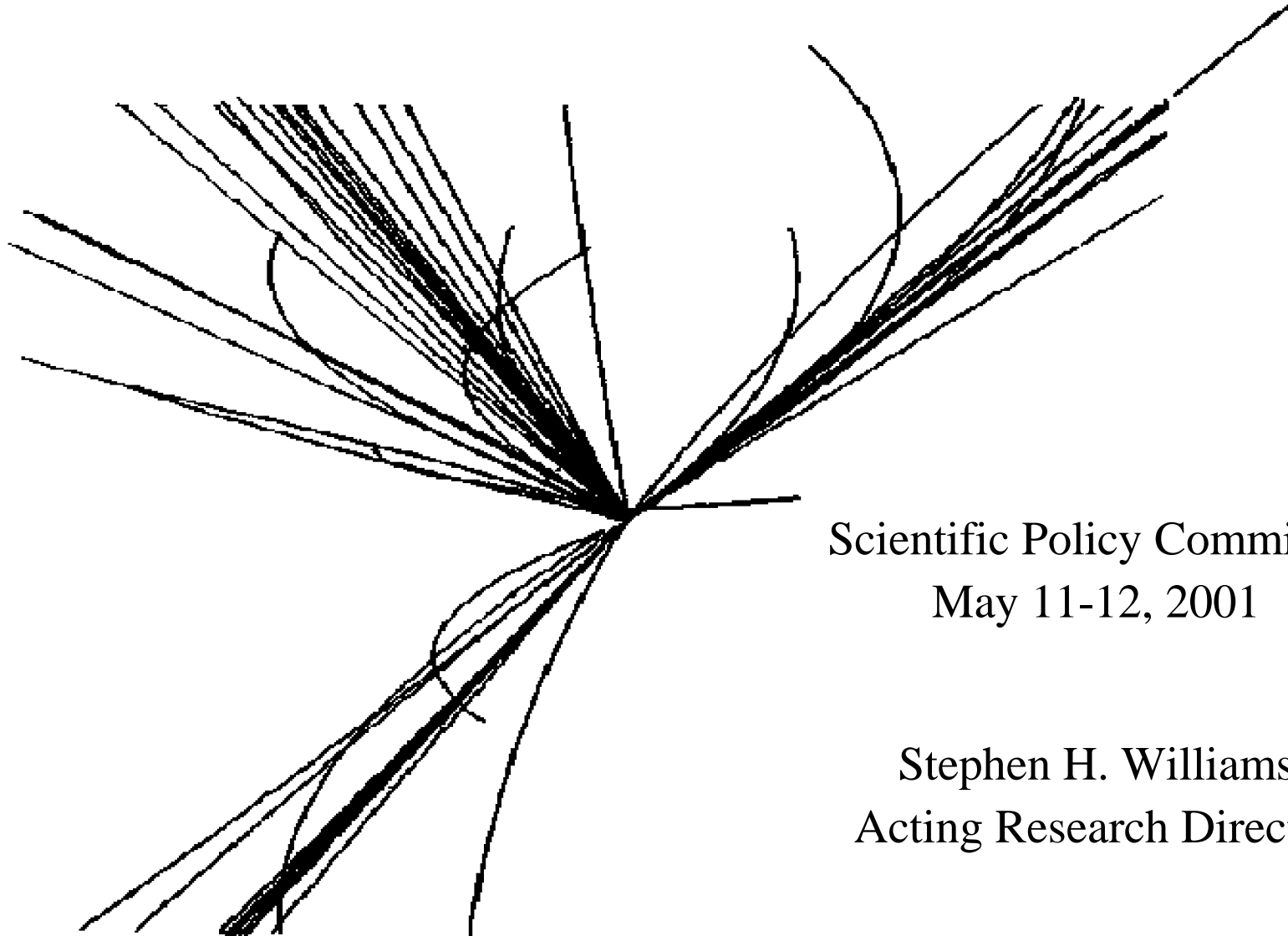
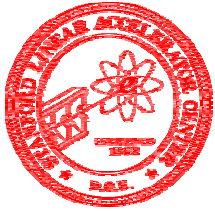


Research Director's Report



Scientific Policy Committee
May 11-12, 2001

Stephen H. Williams
Acting Research Director

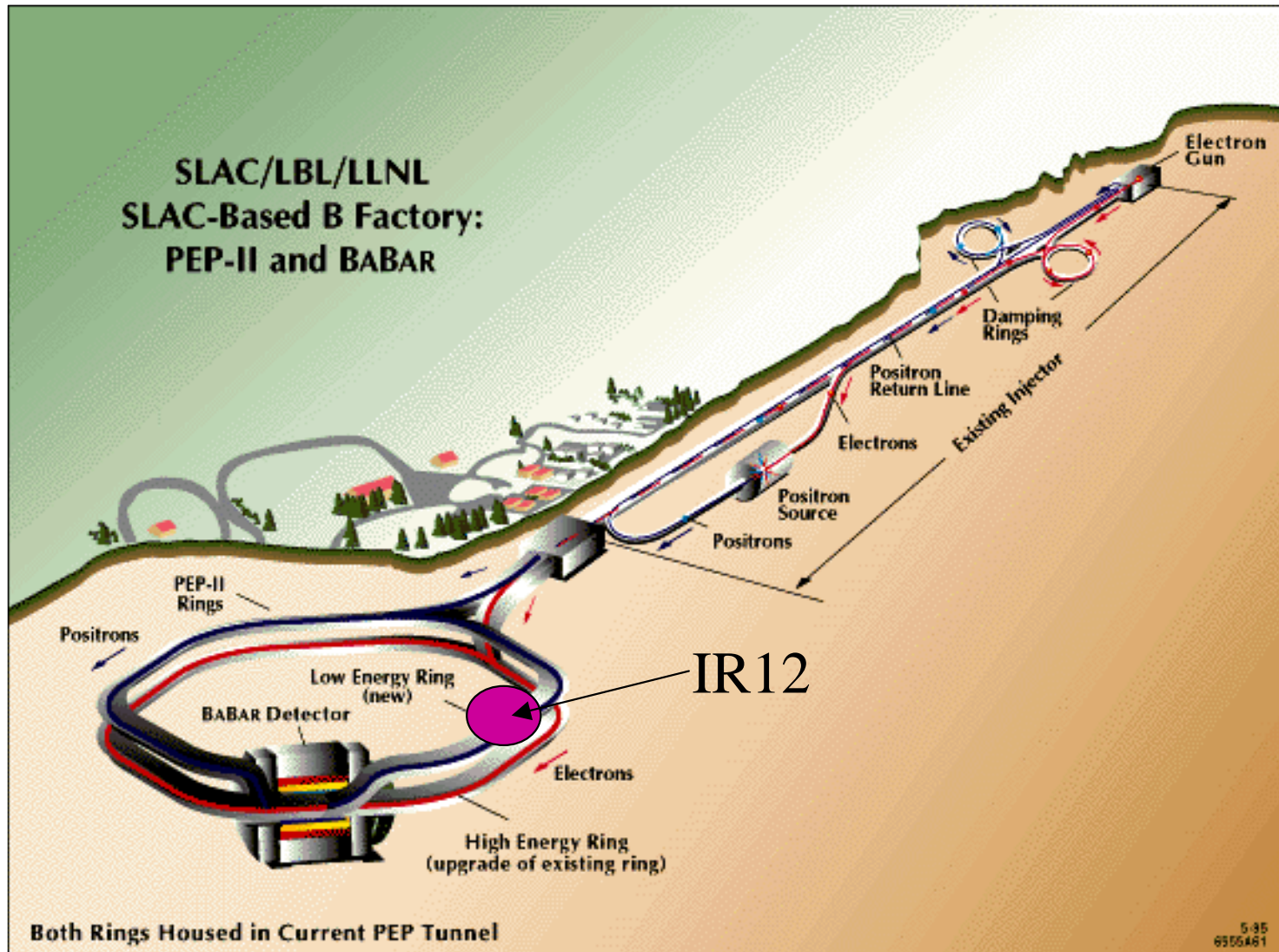


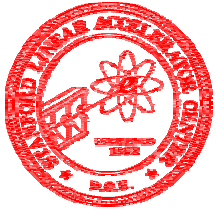
Exploring New Initiatives

- PEP N
 - Novel extension to PEP II – e^+e^- @ $1 < 3$ GeV
 - Broad range of physics: physics of R, meson spectroscopy, time-like nucleon form factor
 - Workshop April 29-May 2 to develop case
- EXO – Enriched Xenon Observatory
 - Potentially very sensitive measure of neutrino mass
 - Fundamental question in SM and cosmology
 - R&D to study proof of principle



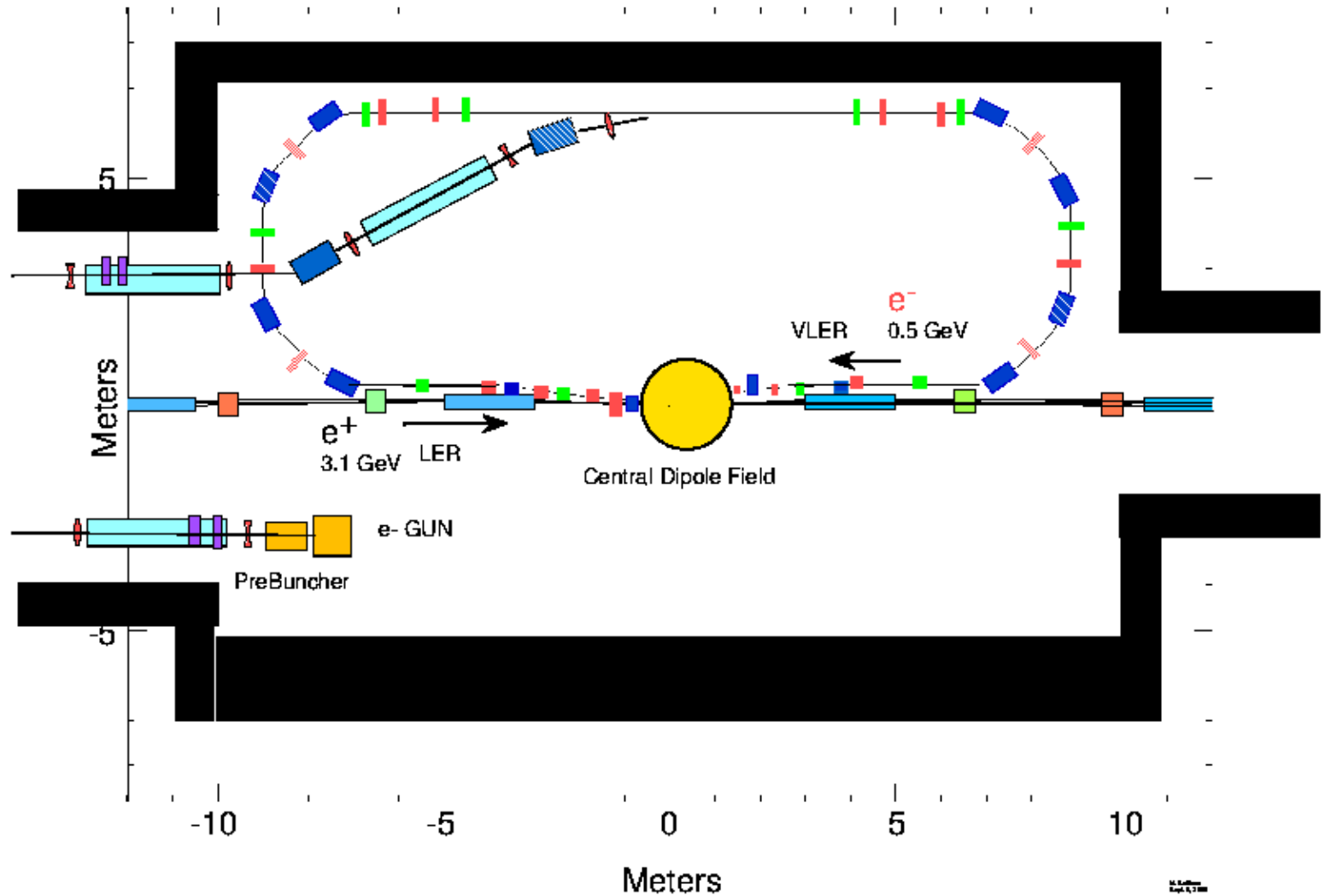
PEP N Ring Location

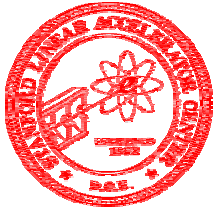




PEP N: Approximately 1 to 3 Gev Asymmetric Ring

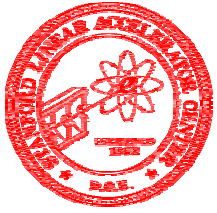
Layout of PEP-N in Interaction Region 12





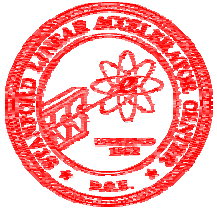
EPAC History

- Two LOI's in November: machine and physics experiment
- Machine looked very do-able, non-interfering with PEP II/Babar
- Physics of R attractive to Big Questions
- Other physics very interesting but not driving
- Detector not detailed enough



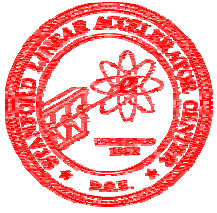
A Workshop

- EPAC didn't want to reject but not ready for proposal
- Workshop called for to solidify physics motivation and provide more detector(s) detail
- Develop a program of world class, unique measurements
- Strengthen interest and collaboration



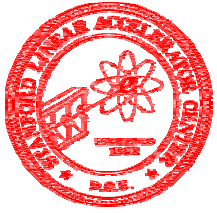
SLAC Expectations

- PEP-II / PEP-N non-interference
- A unique opportunity for SLAC
- PEP N must provide world class physics
- PEP N must have viable collaboration
- PEP N must have viable finance



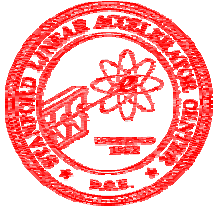
The physics

- Physics of R at this energy range and others related to Higgs: $\rightarrow \delta R/R$?% how well
- $(g-2)_\mu$ result at BNL adds strong interest
- Vector meson spectroscopy
- Time-like hadron form factors
- $\gamma\gamma^*$ interactions



Collaboration

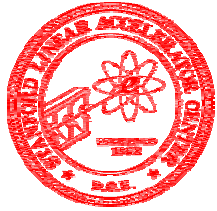
- Strengthen collaboration
- Management: full time onsite leadership
- Strong, dedicated, onsite collaboration management
- Onsite collaboration presence (users + staff)
- Support from dedicated outside users
- Post Docs, graduate students, engineers, technicians needed (SLAC resources thin)



PEP N Workshop

Discussion Topics

- R Measurements with Application to Hadronic Corrections to $g-2$ and Higgs Mass Prediction
- Baryon and Meson Time-Like Form Factors
- Precision QCD Tests
- Vector Meson Spectroscopy
- Two-Photon Physics
- Potential Uses of Initial-State Polarization
- Dimuonium and Ditaonium Formation and Detection
- Accelerator/Detector Requirements



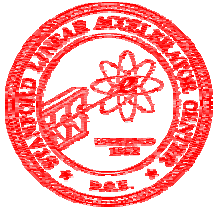
PEP-N Committees

Advisory Committee

C. Carlson	William and Mary
F. Close	Rutherford
P. Dalpiaz	Ferrara
D. Drechsel	Mainz
S. Drell	SLAC
S. Dubnicka	Bratislava
P. Hoyer	Nordita
V. Hughes	Yale
D. Hitlin	Caltech
H. Kühn	Karlsruhe
P. Laurelli	LNF
P. Lepage	Cornell
W. Marciano	Brookhaven
A. Martin	Durham
A. Skrinsky	BINP
V. Sidorov	BINP
H. Tao	IHEP

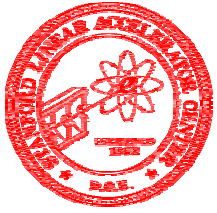
Local Organizing Committee

T. Anderson	SLAC
R. Baldini	INFN-LNF
D. Bettoni	INFN-Ferrara
S. Brodsky	SLAC
R. Calabrese	INFN-Ferrara
M. Chatwell	SLAC
L. Dixon	SLAC
V. Ivanchenko	BINP
M. Mandelkern	UC Irvine
R. McDunn	SLAC
P. Myers	SLAC
S. Rock	U Massachusetts
J. Seeman	SLAC
G. Solodov	BINP
M. Sullivan	SLAC
S. Williams	SLAC



PEP-N Workshop Highlights

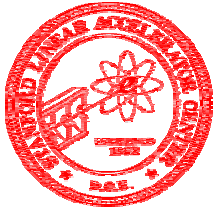
- Large (100+) and enthusiastic, international crowd
- All physics topics discussed
- Equal number of detector talks
- Good discussions of detector trade-offs
- Invited participant/critics from SLAC community



Workshop Highlights 2

Physics drivers:

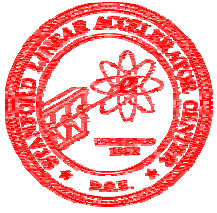
- $R = (\text{e}^+\text{e}^- \rightarrow \text{hadrons}) / (\text{e}^+\text{e}^- \rightarrow \text{muons})$
- R error in 1.5-2.5 region 25% $\rightarrow \alpha_s(m_Z)$
- Need 1% $\delta R/R$ in this region
- Other future R measurements:
 - Cornell >2 Gev
 - DAFNE/KLOE
 - VEPP2000



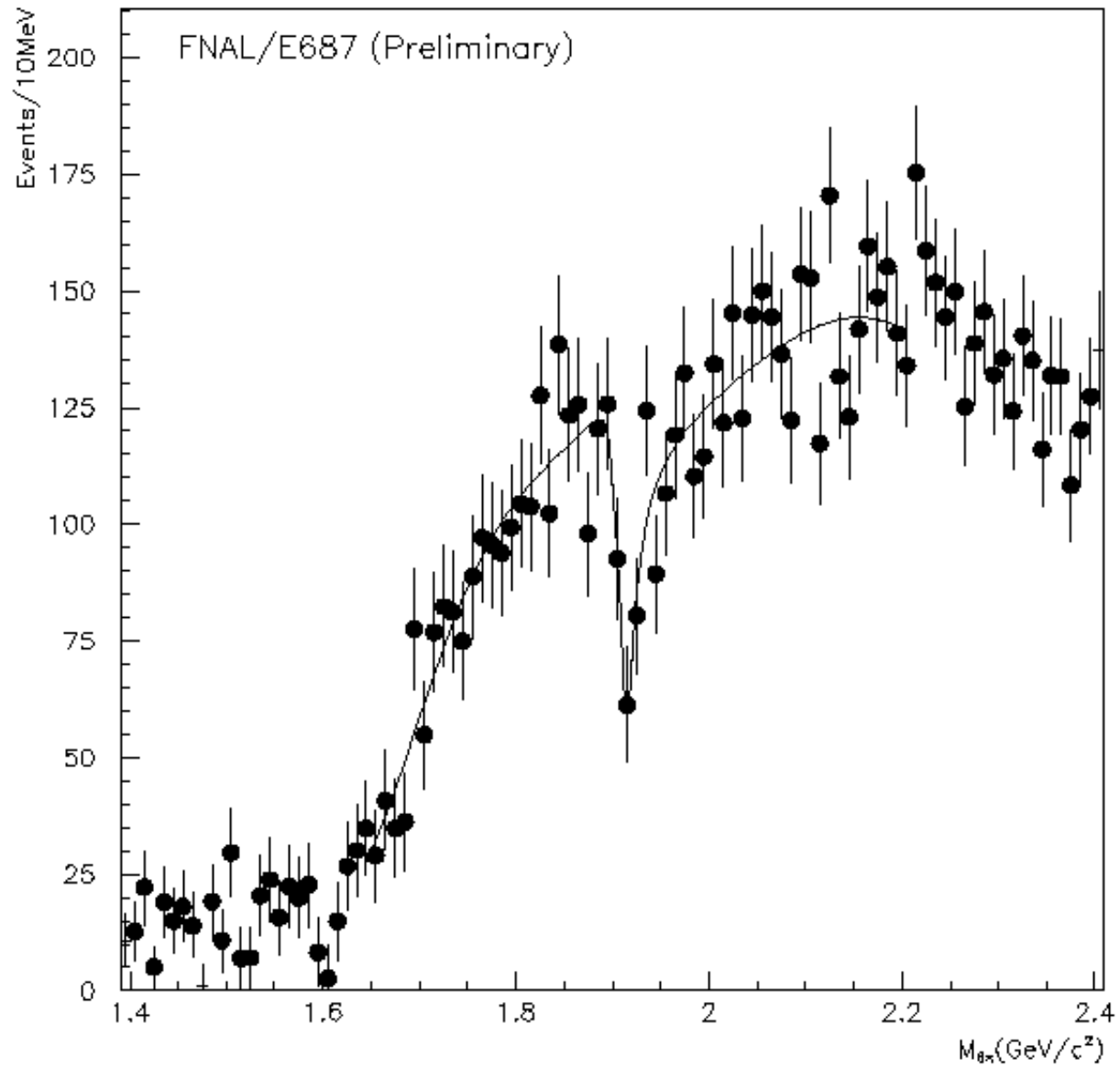
Workshop Highlights 3

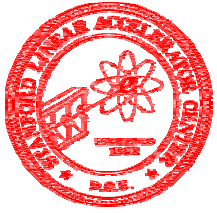
Vector Meson Spectroscopy/Nucleon Form Factors

- > 1.4 GeV low cross-sections, need higher L
- Radial excitations of ρ , ω , ϕ : ρ (1450), ρ (1700), ω (1420), ω (1600), ϕ (1690)
- How many light-quark vector mesons are there? What are their masses, widths, decay channels?
- Similar situation for N - N bar – 6 quark states
- Chemistry of quarks: how well does QCD work in this region?
- PEP N would provide a unique tool to study.

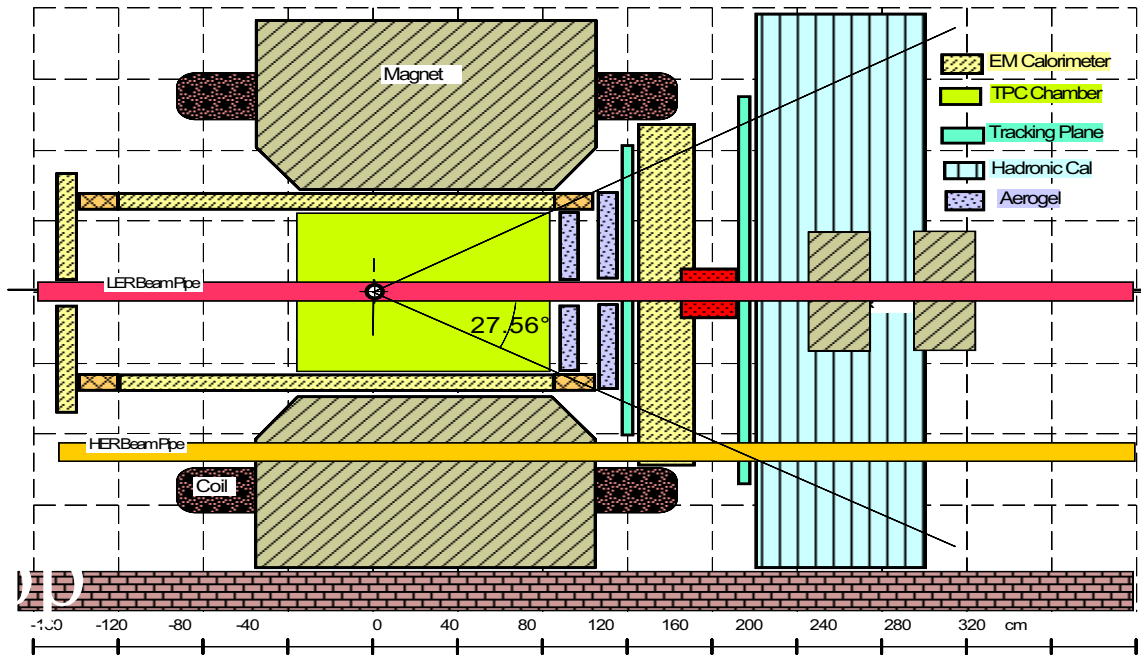


6 pion Channel - Photoproduction at FNAL

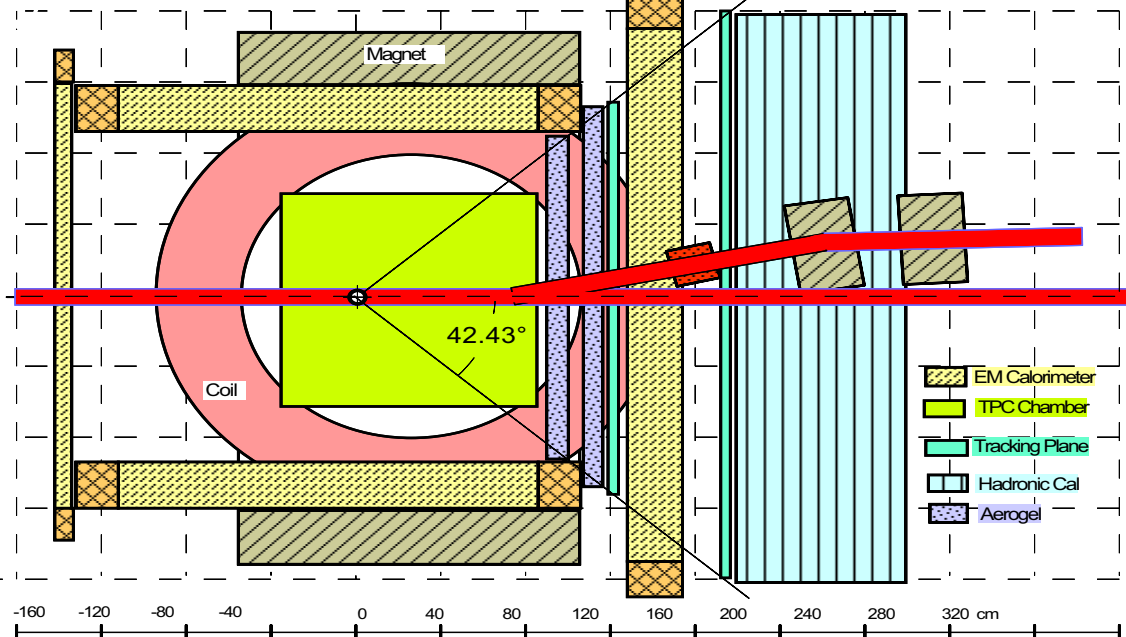


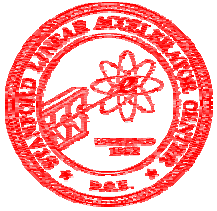


Side view



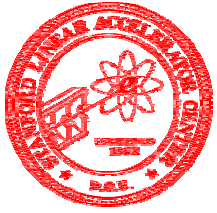
Top view





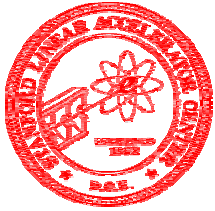
Workshop “Critics Corner”

- What is highest priority? R/form factors/ exclusive final states? Can this be done with one general purpose detector?
- Good simulation but much more is needed.
- Is 3% good enough for R?
- Expect calibration on the J/ψ (a stretch for the machine)
- Backgrounds need study
- Dipole vs solenoid: backgrounds and Babar interference concern
- Consider non magnetic detector with crossing angle



The Future

- Collaboration meetings, LOI/proposal submission
- EPAC trying to meet twice a year
- LOI review in September '01
- Proposal submission in Spring '02
- Thumbs up or down on approval
- Budget/schedule planning begins



Summary: The Next 10 Years

<u>Now</u>	<u>Next year/few years</u>	<u>Long Term 5+ years</u>
Pep II <i>BaBar</i>	PEP II/ <i>BaBar</i> luminosity upgrades	High Lum PEP II/ <i>BaBar</i> operations
E 158 Moller Scattering	E 158 Moller Scattering Polarized Photon Beam Experiments	Future ESA experiments?
Plasma Acceleration and Focusing	Advanced Accelerator	Advanced Accelerator
Build GLAST	Build/Launch GLAST	GLAST operation & analysis
NLC R&D	NLC R&D and Engineering	NLC participation
Pep N Workshop, EXO R&D	Consider PEP N, EXO	?
Small Experiment	Small Experiments	Small Experiments
PAP Experiments	PAP Experiments	Future PAP experiments
Test Beams	Test Beams	Test Beams