GEp(III) in Hall C

Experiment 01-109, approved July 2001

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Hall C Meeting, Jan. 12, 2002

GEP(III) PARTICIPATING INSTITUTIONS

College of William and Mary
Norfolk State University
Jefferson Lab
University of Regina, Canada
Argonne National Laboratory
California State University at Los Angeles
Carnegie Mellon University
DAPNIA, Saclay, France
Duke University/TUNL
Eastern Kentucky University
Florida International University
Hampton University
University of Illinois
Institut de Physique Nucléaire, Orsay, France
Institute of Physics and Technology, Kharkov
University of Maryland
Institute for High Energy Physics, Protvino
INFN-ISS, -Roma3, -Roma1, -Bari,Italy
University of Lund, Sweden
Laboratory for High Energy, JINR, Dubna
Massachussetts Institute of Technology
Middle East Technical University, Turkey
University of New Hampshire
North Carolina Central University
Northwestern University
Old Dominion University
Rutgers University
Yerevan Physics Institute, Armenia

Polarization transfer in elastic ep

For large Q^2, best way to measure $\mu_p G_{Ep}/G_{Mp}$ in

$$e + p \rightarrow e + p$$

Akhiezer, Rekalo (1973), Arnold, Carlson, Gross (1981)

$$I_0 P_t = -2\sqrt{\tau(1+\tau)}\, G_{Ep} G_{Mp} \tan(\theta_e/2)$$

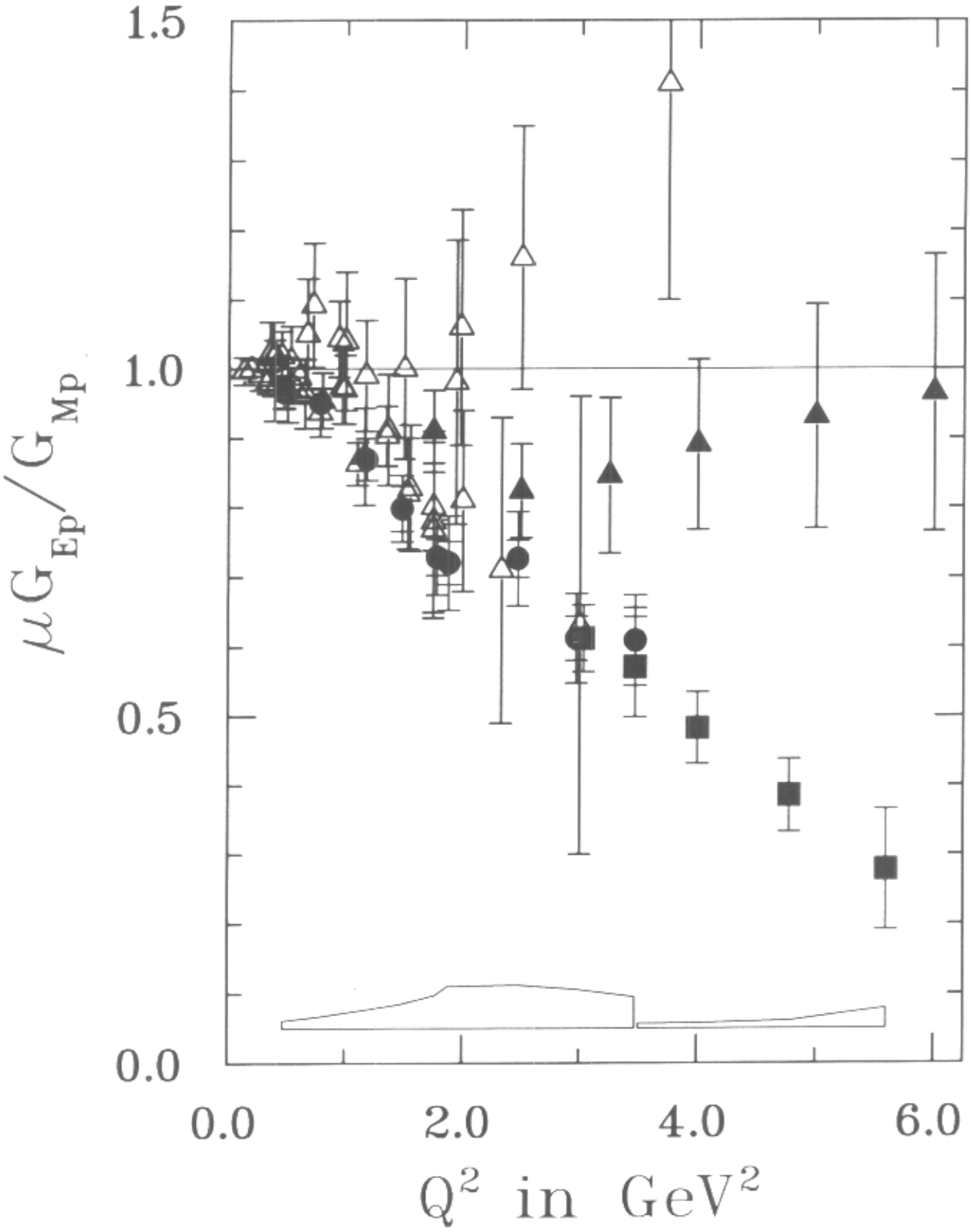
$$I_0 P_\ell = \frac{E_e + E_{e'}}{m_p}\sqrt{\tau(1+\tau)}\; G_{Mp}^2 \tan^2(\theta_e/2)$$

with $I_0 = G_{Ep}^2 + \tau G_{Mp}^2 [1 + 2(1+\tau)\tan^2(\theta_e/2)]$

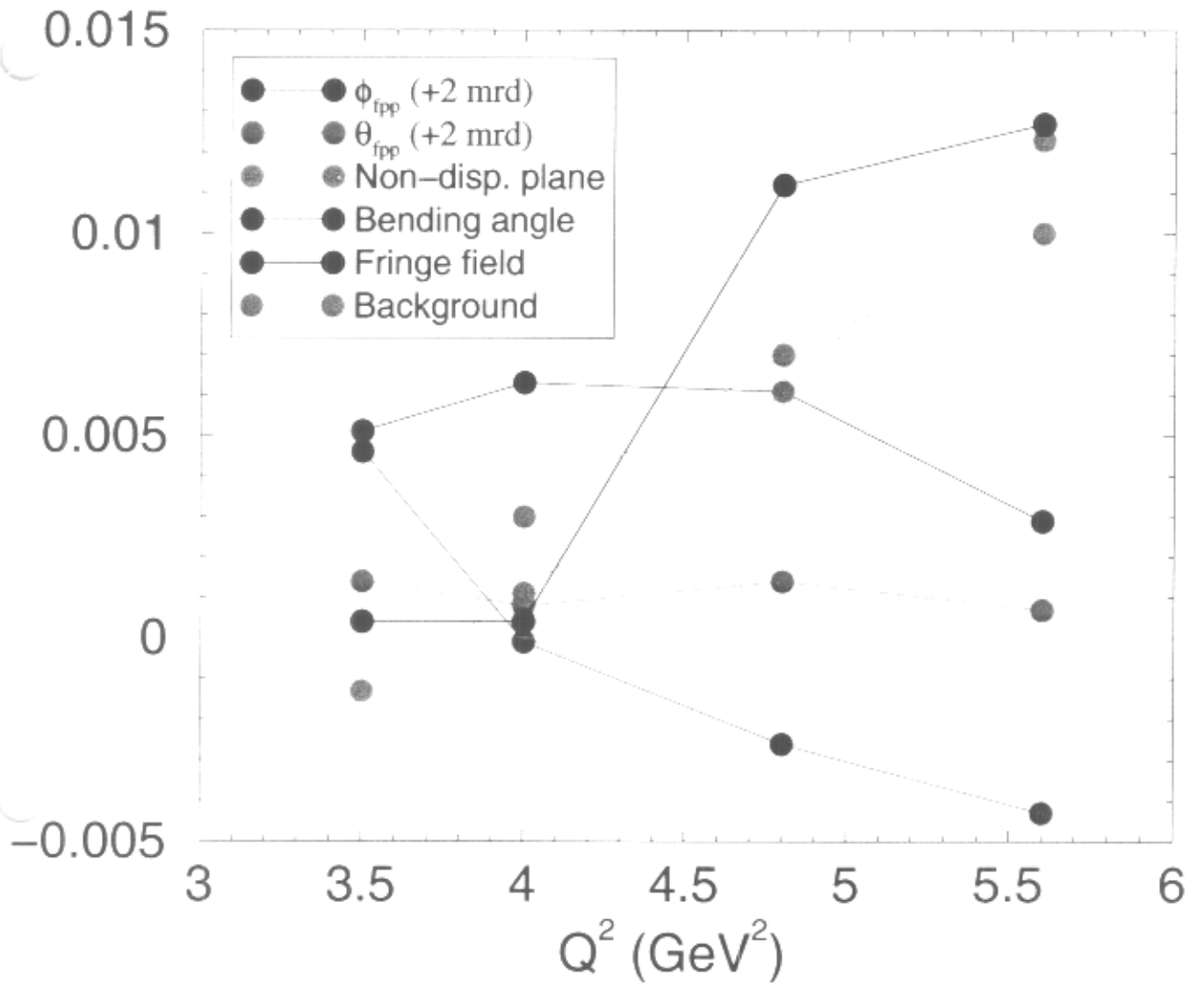
$$\tau = \frac{Q^2}{4 m_p^2}$$

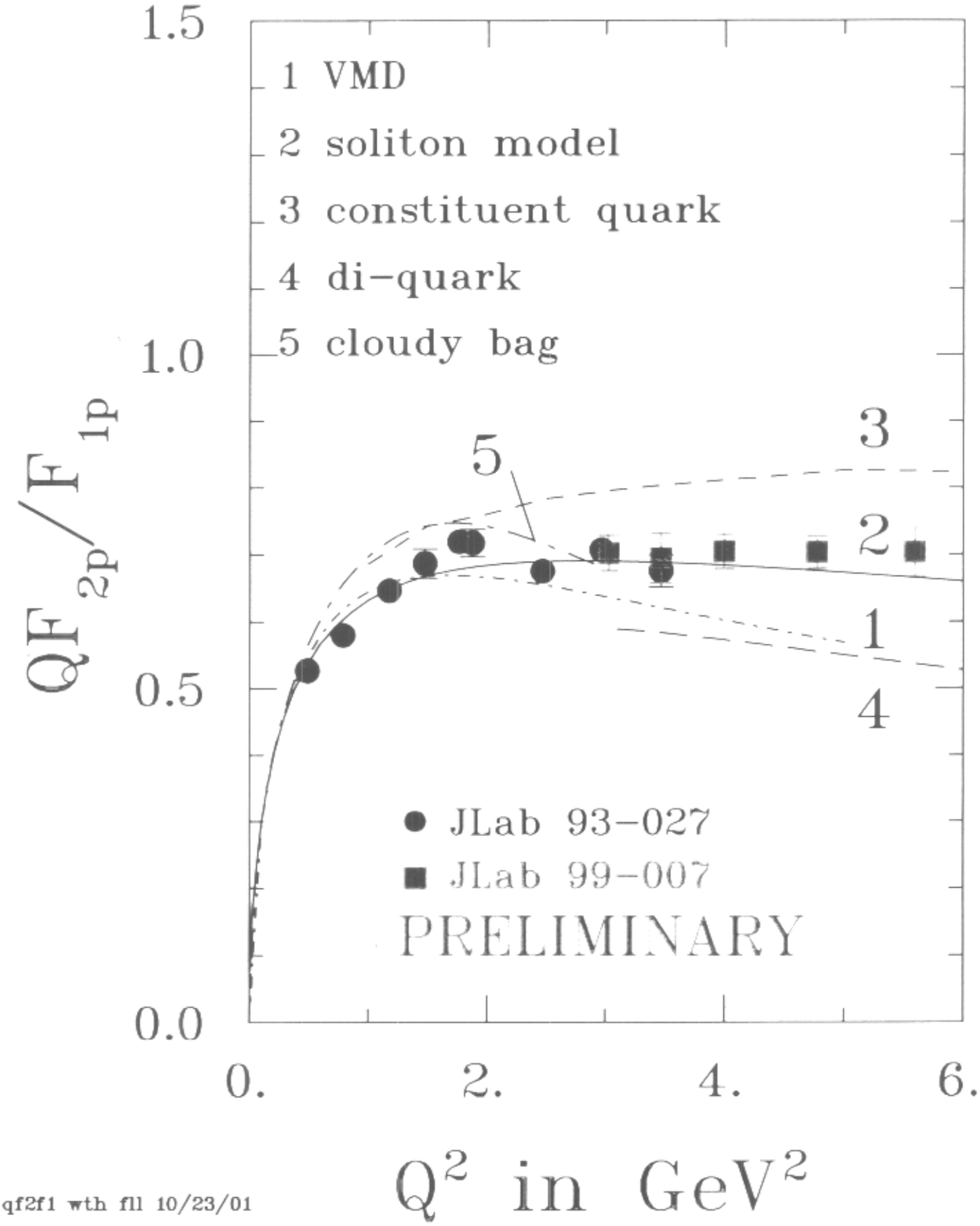
P_ℓ and P_t are polarization transfer components **at target** with h=1

$$\frac{P_t}{P_\ell} = \frac{-2 m_p}{(E_e + E_{e'})\tan(\frac{\theta_e}{2})} \frac{G_{E_p}}{G_{M_p}}$$

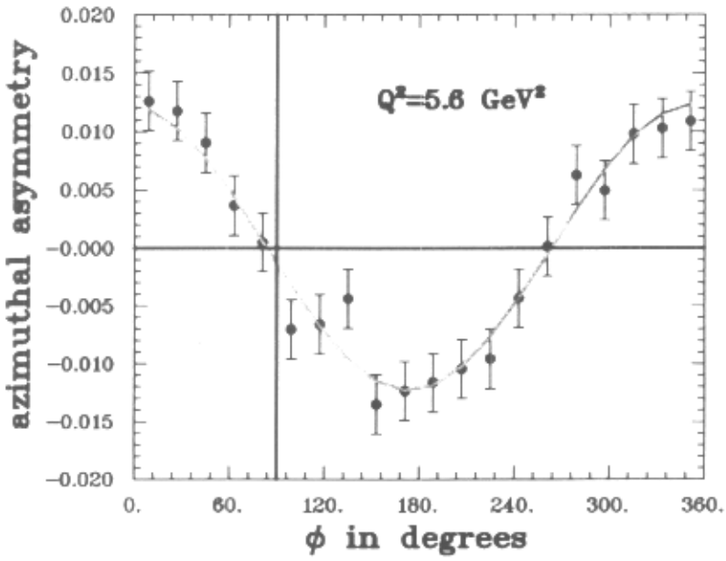


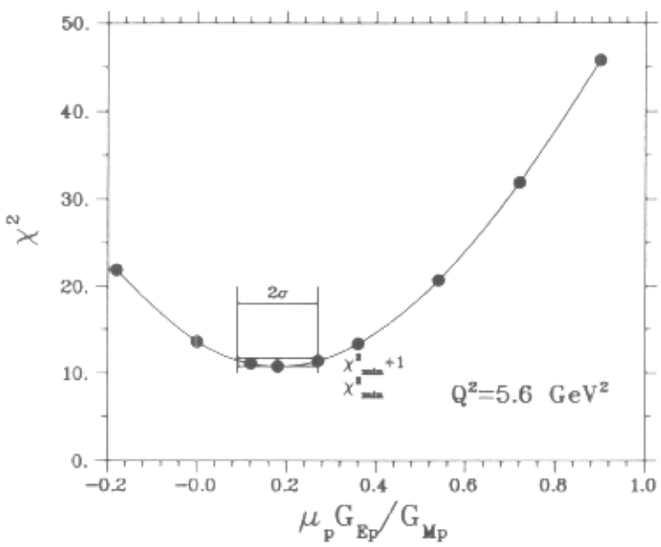
gepgmp world jlab not lin 10/29/01

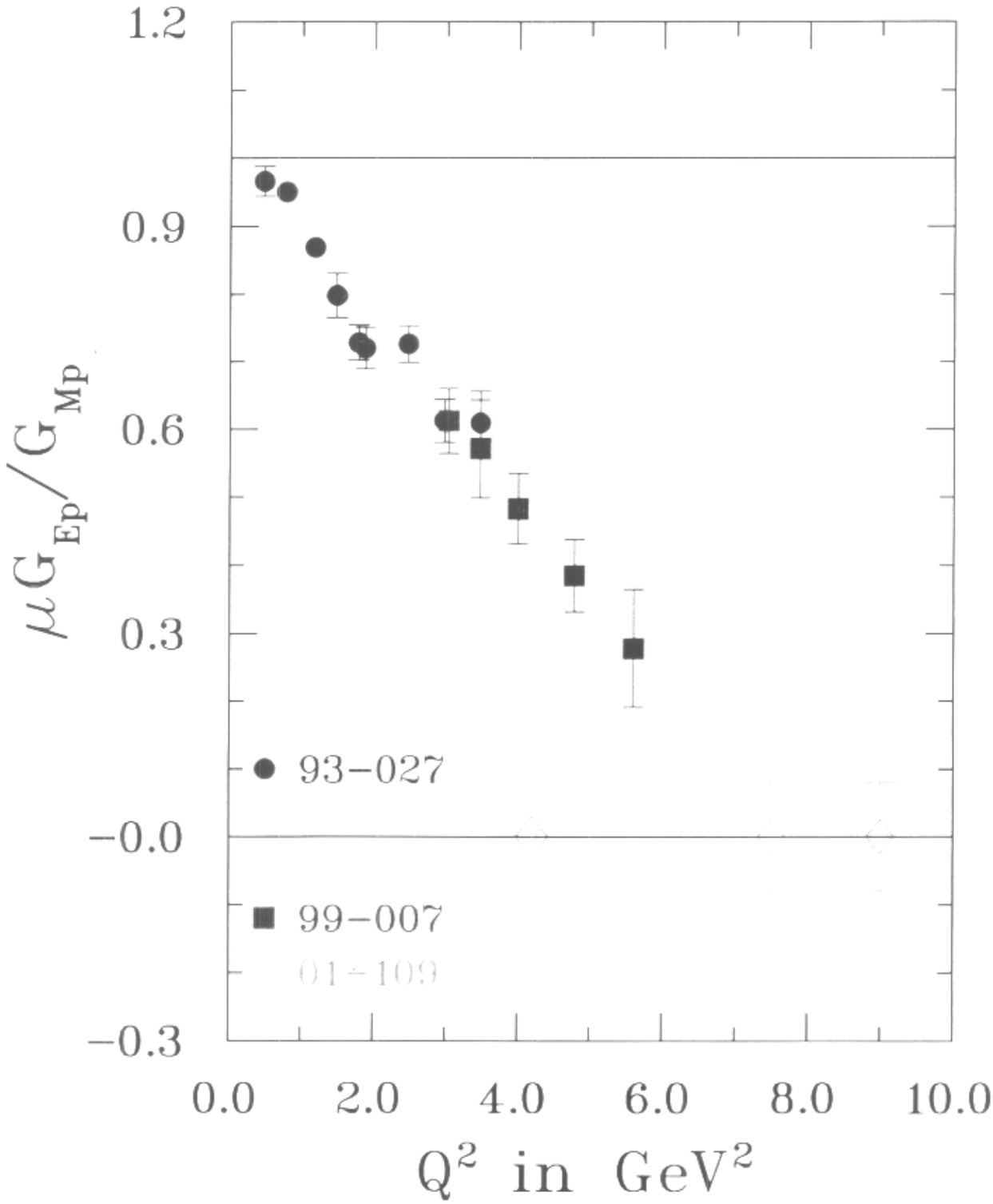




qf2f1 wth fll 10/23/01


azimuthal asymmetry
0.020
0.015
0.010
0.005
−0.000
−0.005
−0.010
−0.015
−0.020
Q²=5.6 GeV²
0.
60.
120.
180.
240.
300.
360.
φ in degrees


χ²
50.
40.
30.
20.
10.
0.
2σ
Q²=5.6 GeV²
−0.2
−0.0
0.2
0.4
0.6
0.8
1.0
μ_p G_Ep/G_Mp



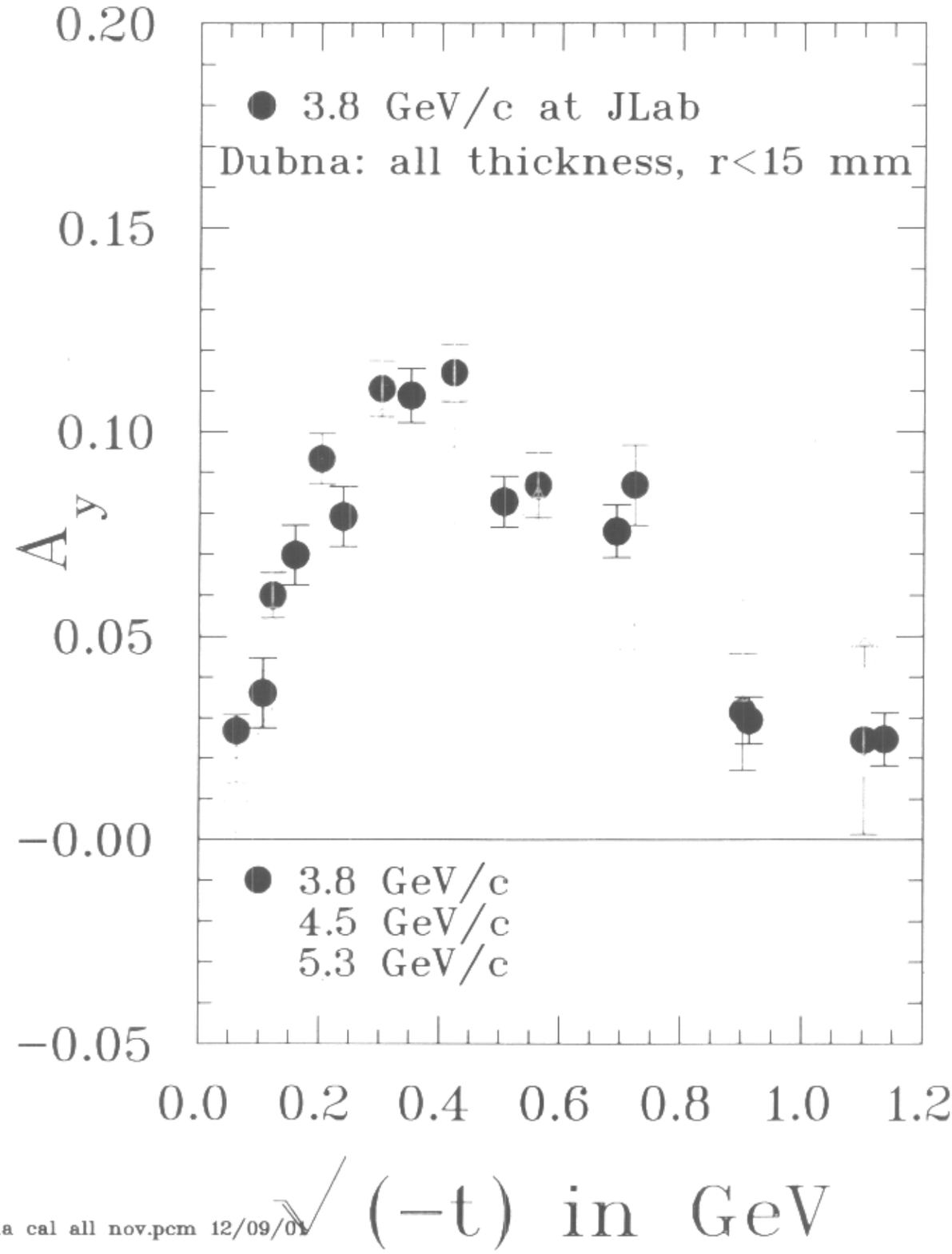
gep he 007 fll 11/20/01

The kinematics of 01-109

Q^2	E_e	$E_{e'}$	T_p	p(HMS)	$\theta_{e'}$	θ_p	precess.
GeV^2	GeV	GeV	GeV	GeV/c	deg.	deg.	deg.
4.2	4.0	1.7	2.238	3.035	46	24	152
7.5	6.0	2.0	3.197	4.028	46	17	236
9.0	6.0	1.2	4.796	5.657	68	11.4	274

The geometry and rates/time

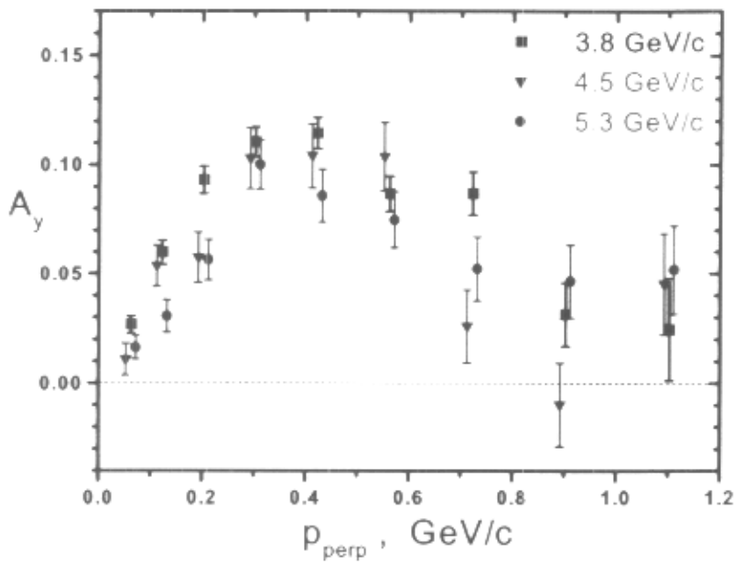
Q^2	Jacob	$\Delta\Omega_{e'}$	distance	rate	time	$\Delta(G_E/G_M)$
GeV^2		sr	m	Hz	Hrs.	total
4.2		0.022	(11) 8.5	105	40	0.04
7.5	6.1	0.037	8.5	12	200	0.08
9.0	26.7	0.135	4.5 m	6	720	0.08



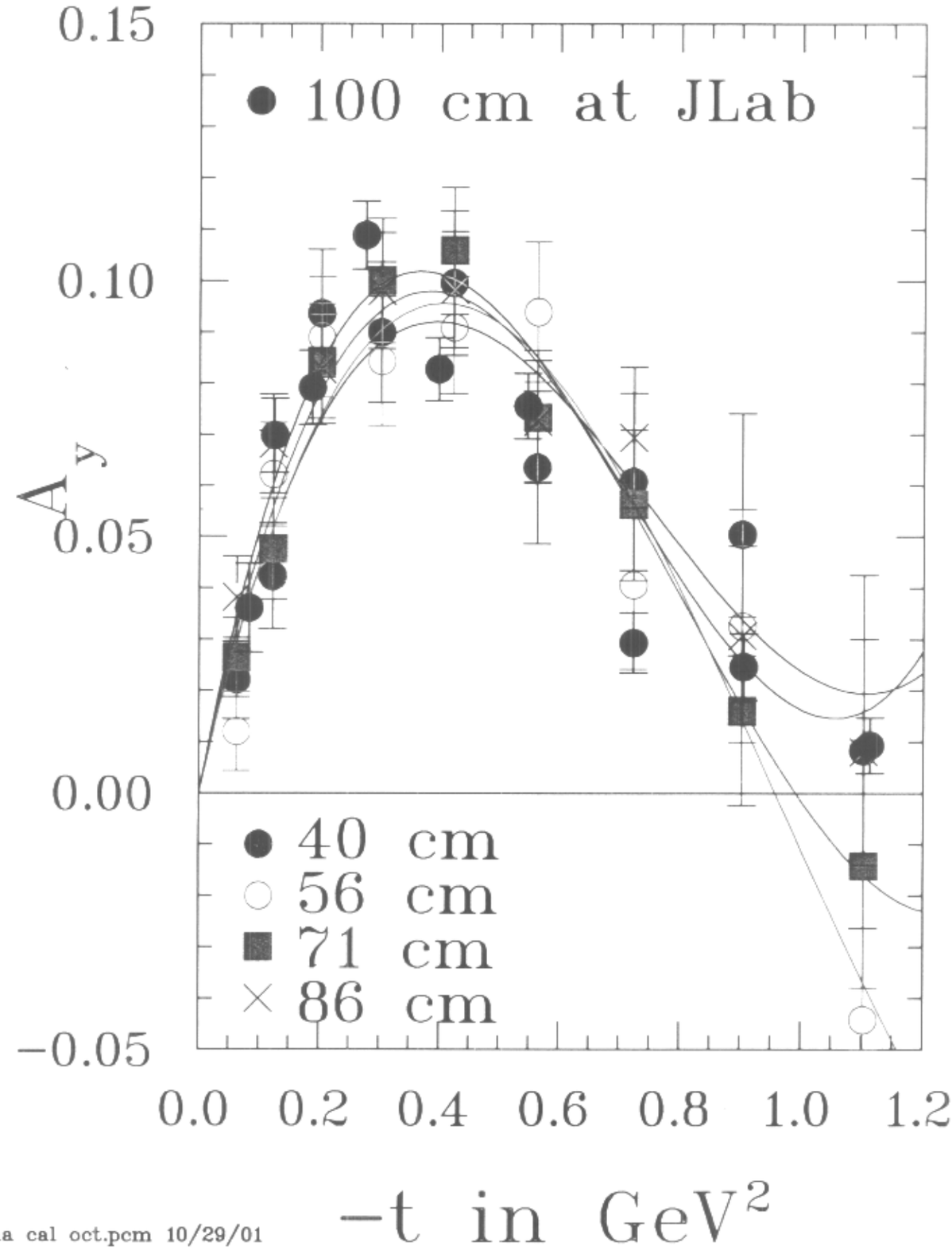
dubna cal all nov.pcm 12/09/01

Measurement of analyzing powers for the reaction p + CH2 at polarized proton momentum 3.8 – 5.3 GeV/c

JINR – DAPNIA, IPN (**France**) - W&M, NSU, TJNAF, RU (**USA**) -
- MSU (**Russia**) - INRNE BAS (**Bulgaria**) collaboration

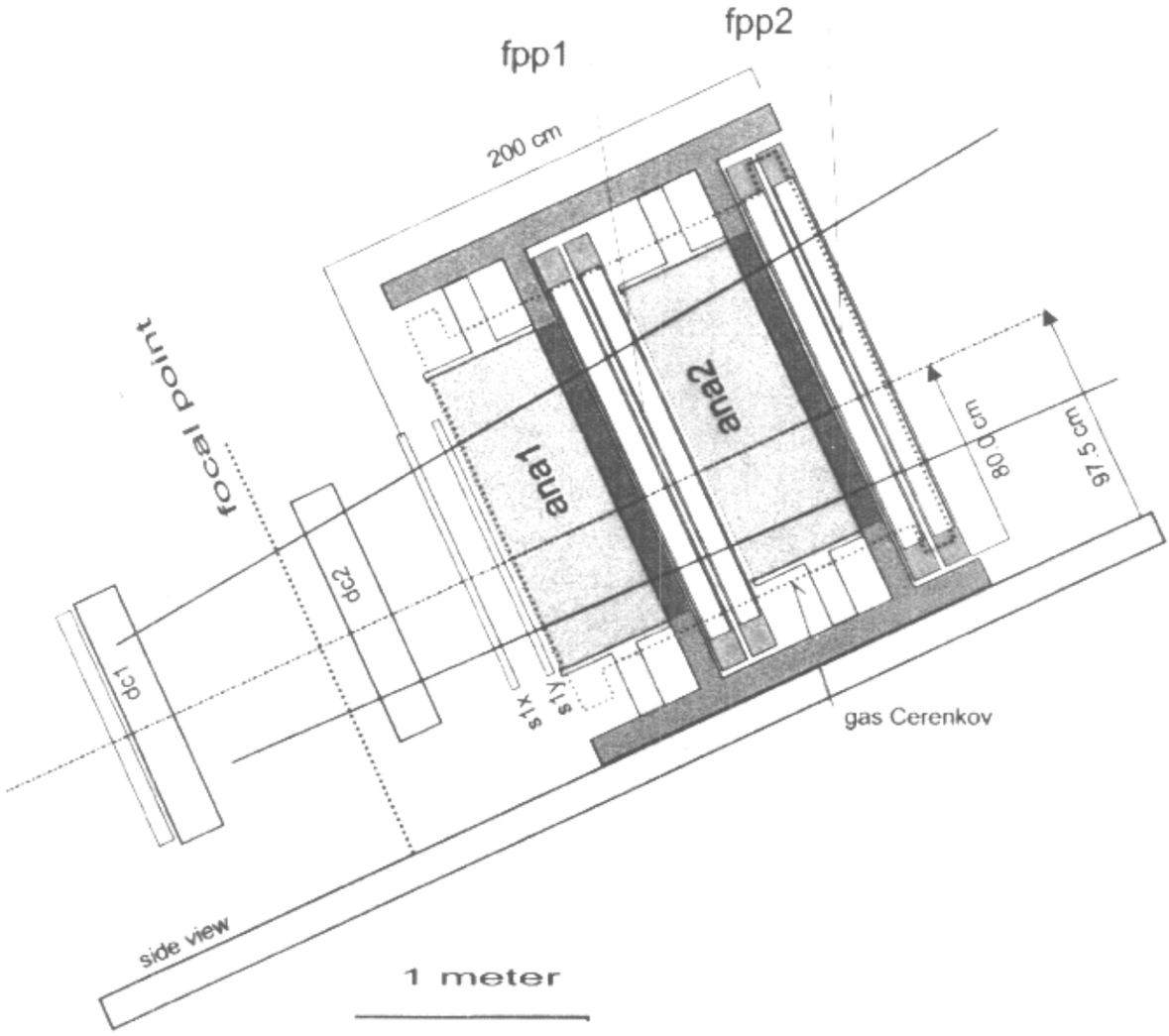


These data are important for the design of a large size polarimeter at Jefferson Lab (USA) which will be used to measure the ratio of the electric and magnetic form factors, G_{Ep}/G_{Mp}, of the proton up to an invariant four momentum transfer of 9 GeV^2.

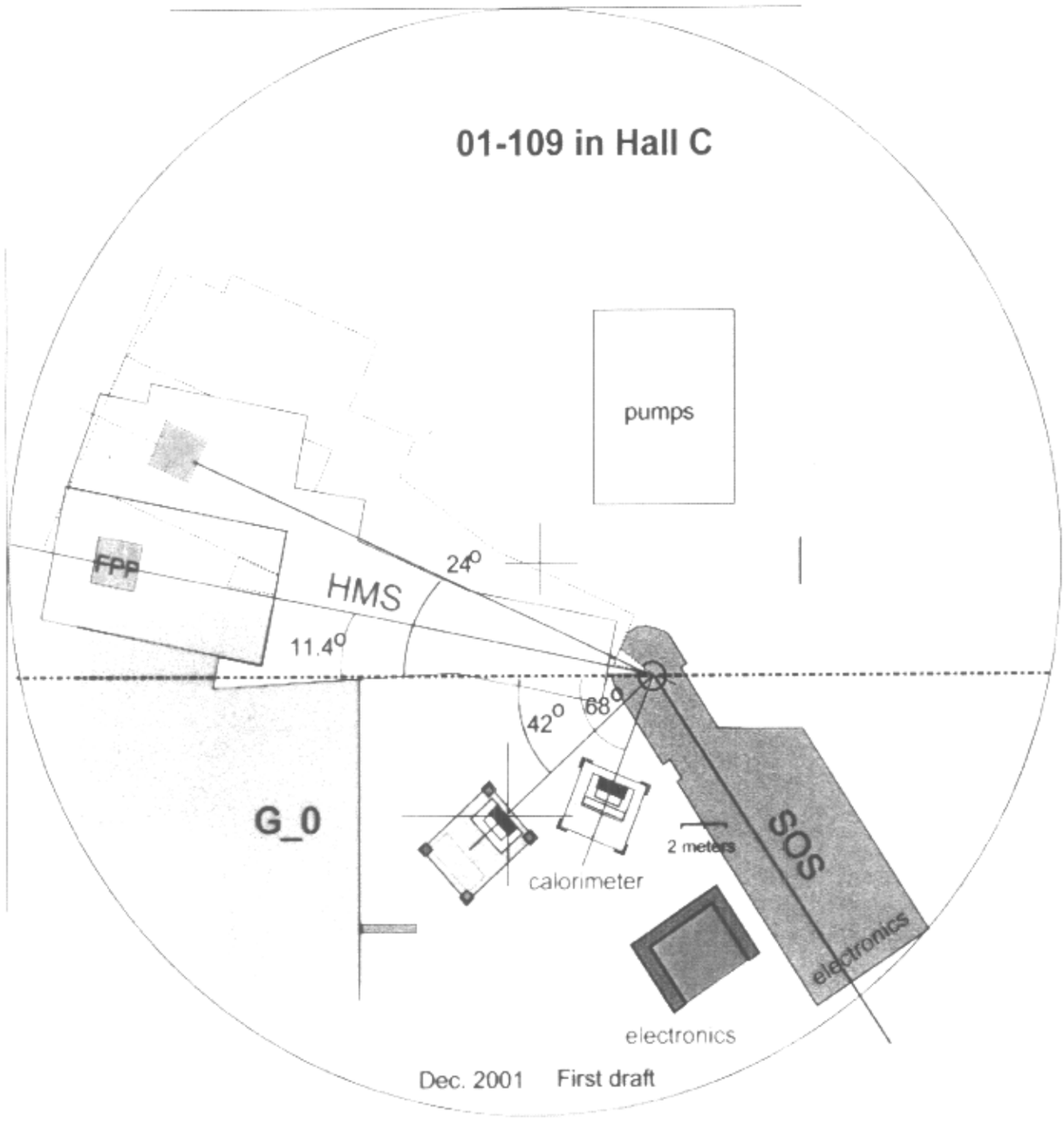


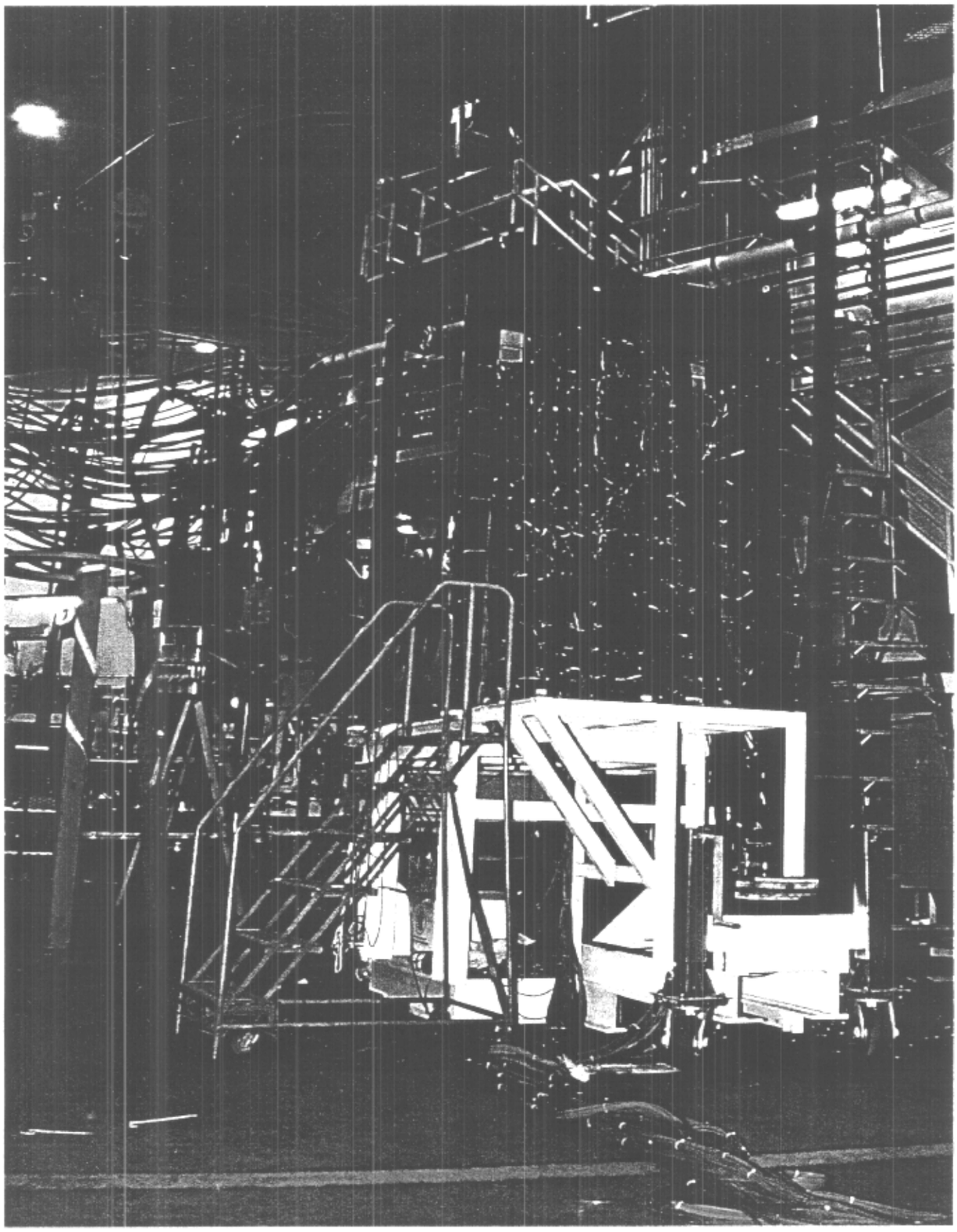
dubna cal oct.pcm 10/29/01

analyzer 145x111x60 cm
chamber 164x132x10.0 cm outside
194x164x11.6 cm sensitive



HMS FPP draft1 1/02

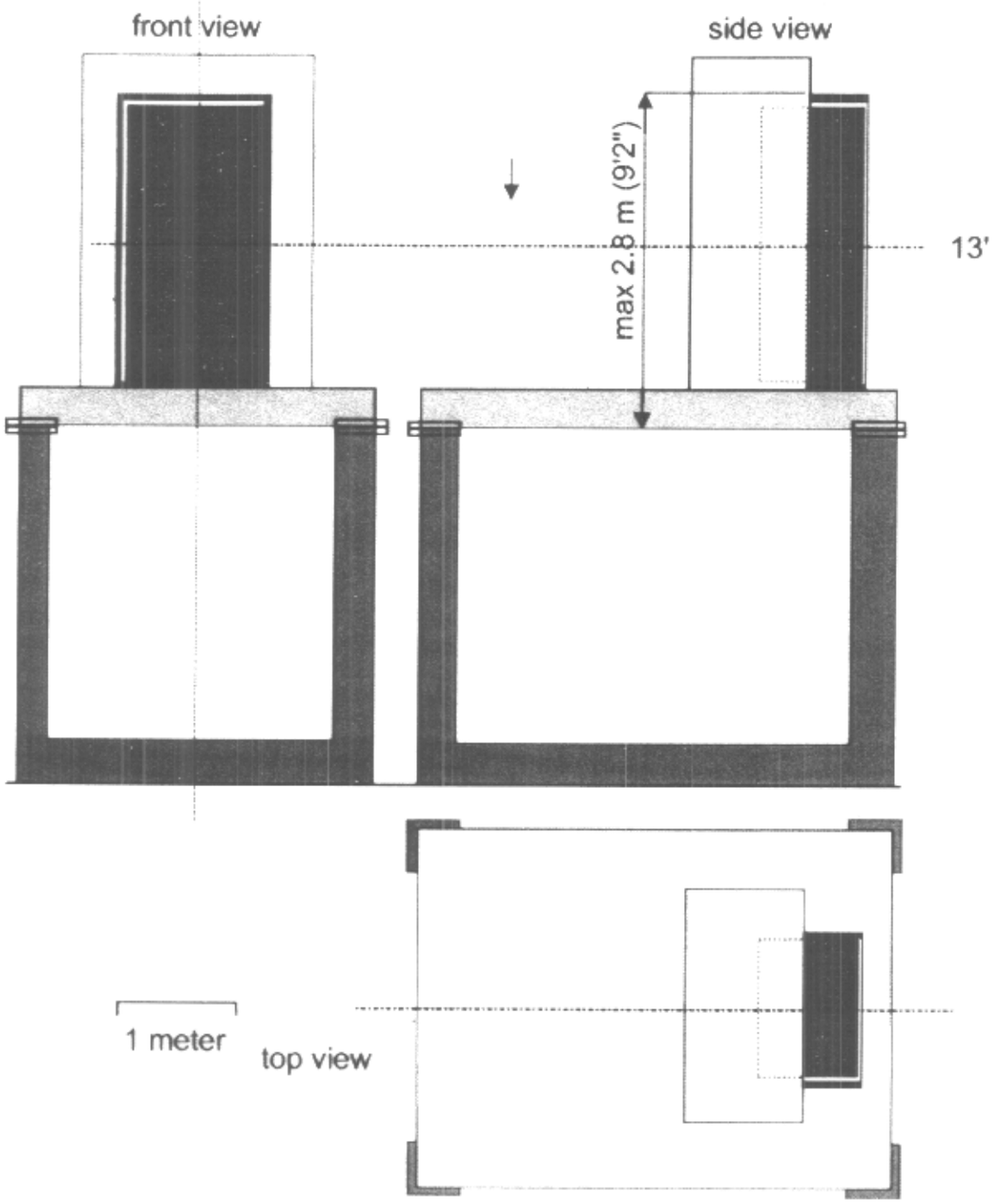

01-109 in Hall C
pumps
FPP
HMS
24°
11.4°
42°
68°
G_0
calorimeter
2 meters
SOS
electronics
electronics
Dec. 2001 First draft



01-109 Calorimeter

Dec. 2001 Second draft

Glass frontal area: 2.32 m H x1.16 m H



Conclusions

- Preliminary design for experiment, calorimeter and FPP exist.
- Start preparation of lead glass rods/PM assemblies May 1. Protvino MOU ready.
- Expect to start manufacture of FPP drift chambers in late Spring 2002.
- Fermilab electronics for calorimeter is here; needs to be tested.
- Need short beam time for background test with lead glass in Hall.
- Need short beam time for optics studies
- Existing HV supplies probably sufficient (RCS+PRIMEX).
- Need to buy 1248 TDCs for new FPP.
- Need to build 125 analog fanin/fanout for calorimeter (Rutgers RCS design) for multiplexing to TDCs and signal splitting to ADCs.
- All main components should be at Jlab by end of 2003 (chambers, frame/analyzer for FPP, platform for calorimeter, electronics)
- Need to work details of understanding with Hall A (Kees), for use of RCS glass and some of the electronics.
- Plan is to get Exp. 01-109 ready to start in 2005.