

# H1 before launch II

## Report to the Collaboration

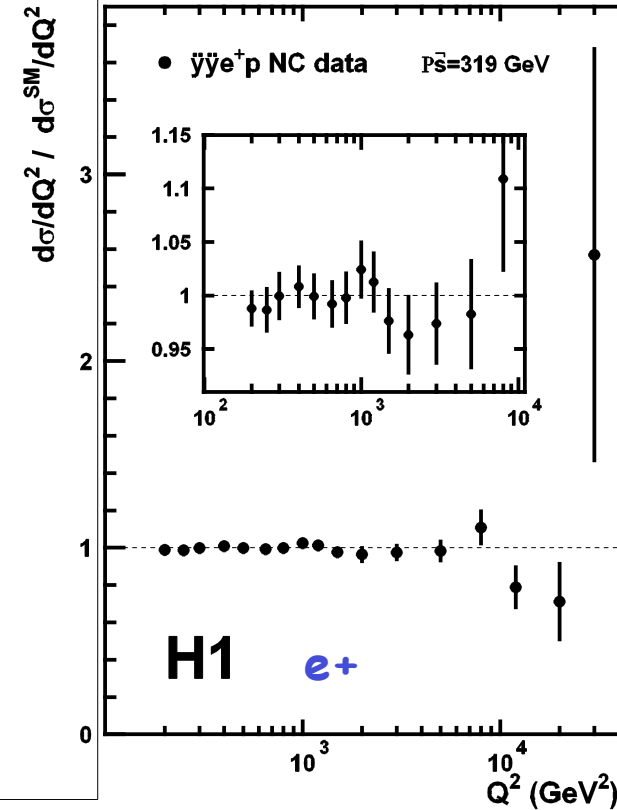
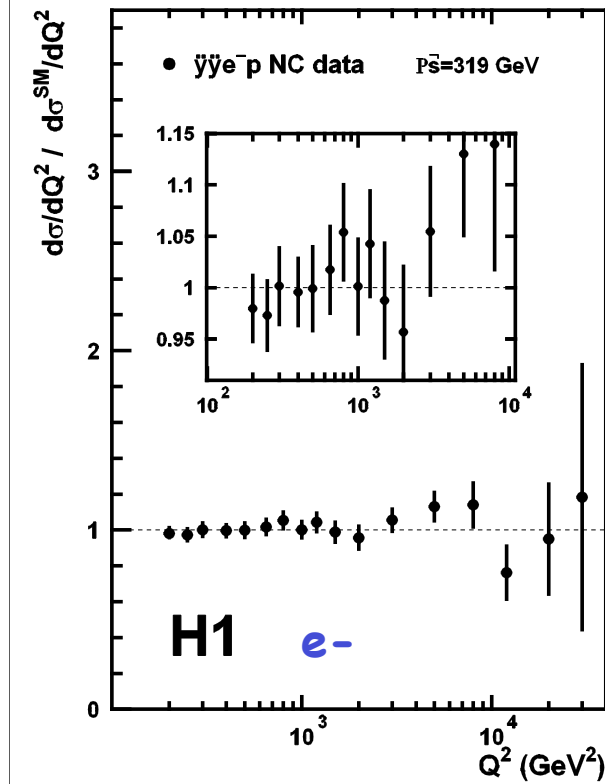
Max Klein

- Publications
- Apparatus
- Restart

- Polarisation
- News
- PRC+LoI

# Search for New Physics in $e^+/-$ Contact Interactions at HERA

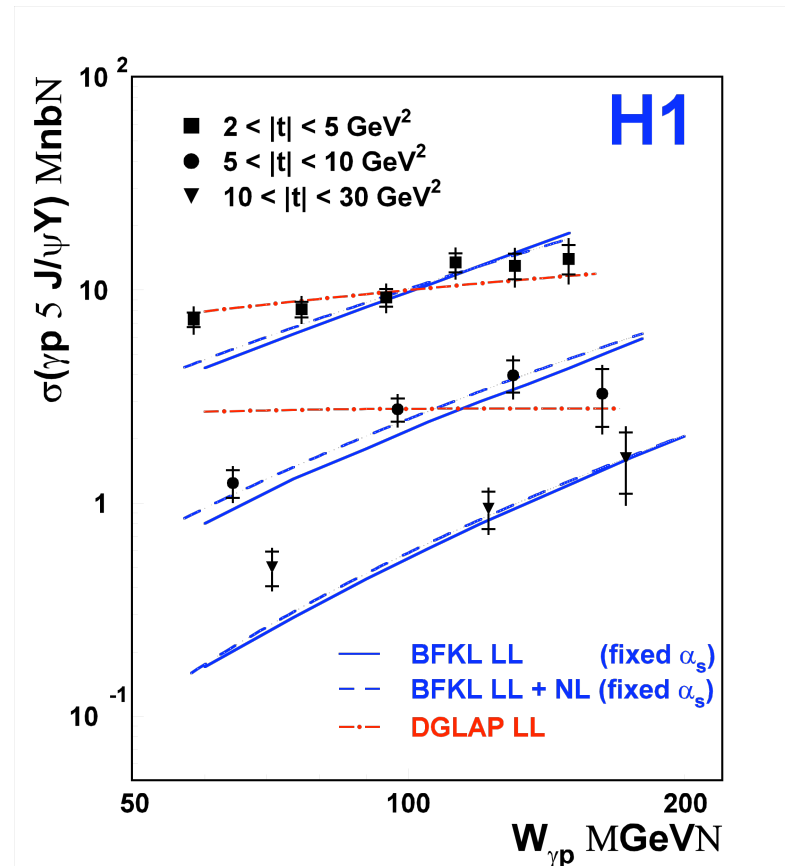
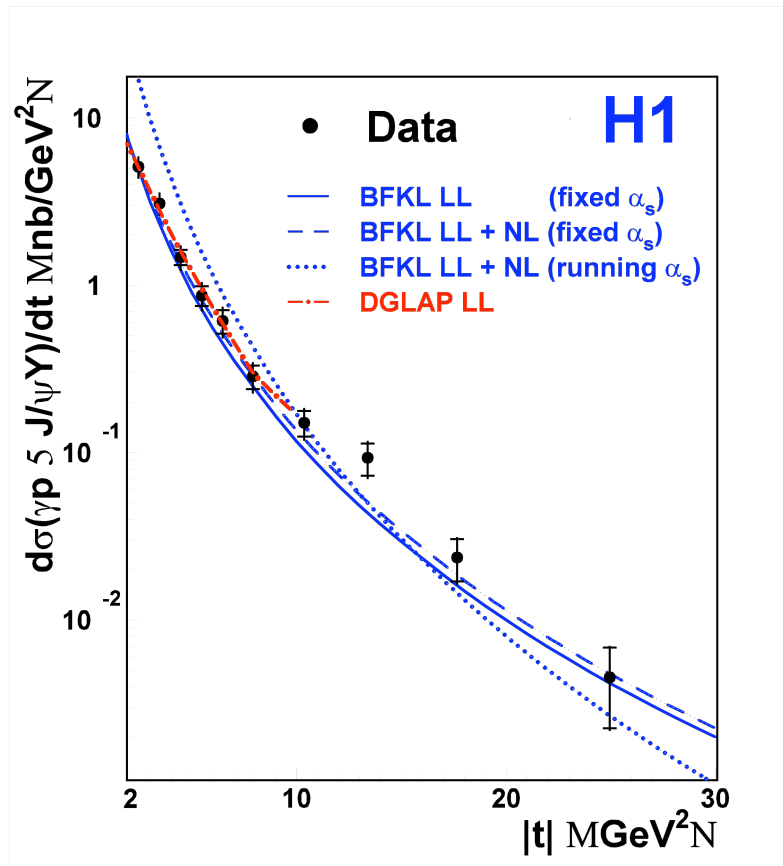
data 1994-2000, 100.8/16.4 pb<sup>-1</sup> accepted by Euro Phys. J



$M > 0.8$  TeV  $r(\text{quark}) < 1.0 \cdot 10^{-18}$  m  $\leftarrow$  the worlds highest resolution microscope

# Diffraction Photoproduction of J/Psi with Large t at HERA

data 1996-2000, 78 pb<sup>-1</sup> submitted to Physics Letters B



# Physics Coordinators Report

## Publication Status

Inclusive jet photoproduction	accepted by Eur. Phys. J
High $Q^2$ paper	accepted by Eur. Phys. J
Contact Int.	accepted by PLB
$J/\psi$ photoprod. at large $t$	Submitted to Phys Lett B
Multi electrons	public reading: June 11, 16
Dijets at low $x$	referee report next week
Pho with PFS	referee report next week
Muon pairs	referee report soon
Search for single top production	referee report soon
Forward $\pi^0$ production	referee report soon
Low $Q^2$ dijets, $\gamma^*$ structure	update this week
LN dijets	T0 soon
Low $Q^2$ $F_2$ , $F_L$	T0 soon
$F_2$ using QEDC	T0 soon

check for ZEUS (cf JG)

extend your student's  
contract such that  
papers get published  
and theses document  
real publications

publish  
preliminary results

(EC 23.6.2003)



EPS 2003:

57 abstracts, 37 papers submitted, 12 new results this week

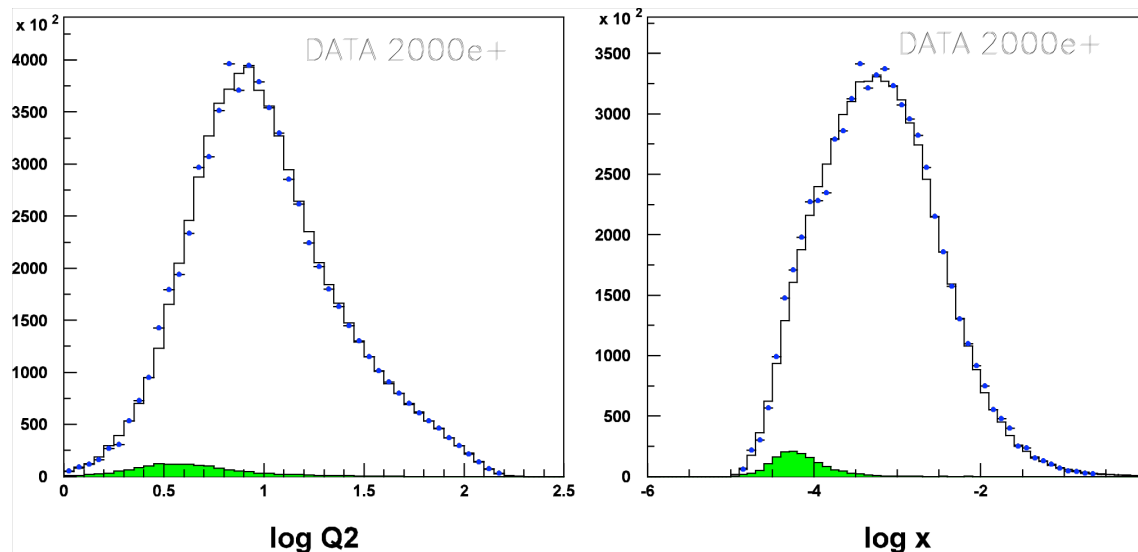
Citation index: H1 has 118 published papers,

50 with 50+ and 17 papers with >100 citations

highest: F2 94 with 373 citations (hep-ex/9602007)

most recent: alphas from F2: 143 (hep-ex/0012053)

still miss key measurements on 99/00 data (F2,F2c,jets,F2D low Q2)



most beautiful  
data of H1

have  $\sim 50\text{pb}^{-1}$   
of SPACAL data  
with S0,S3,S9

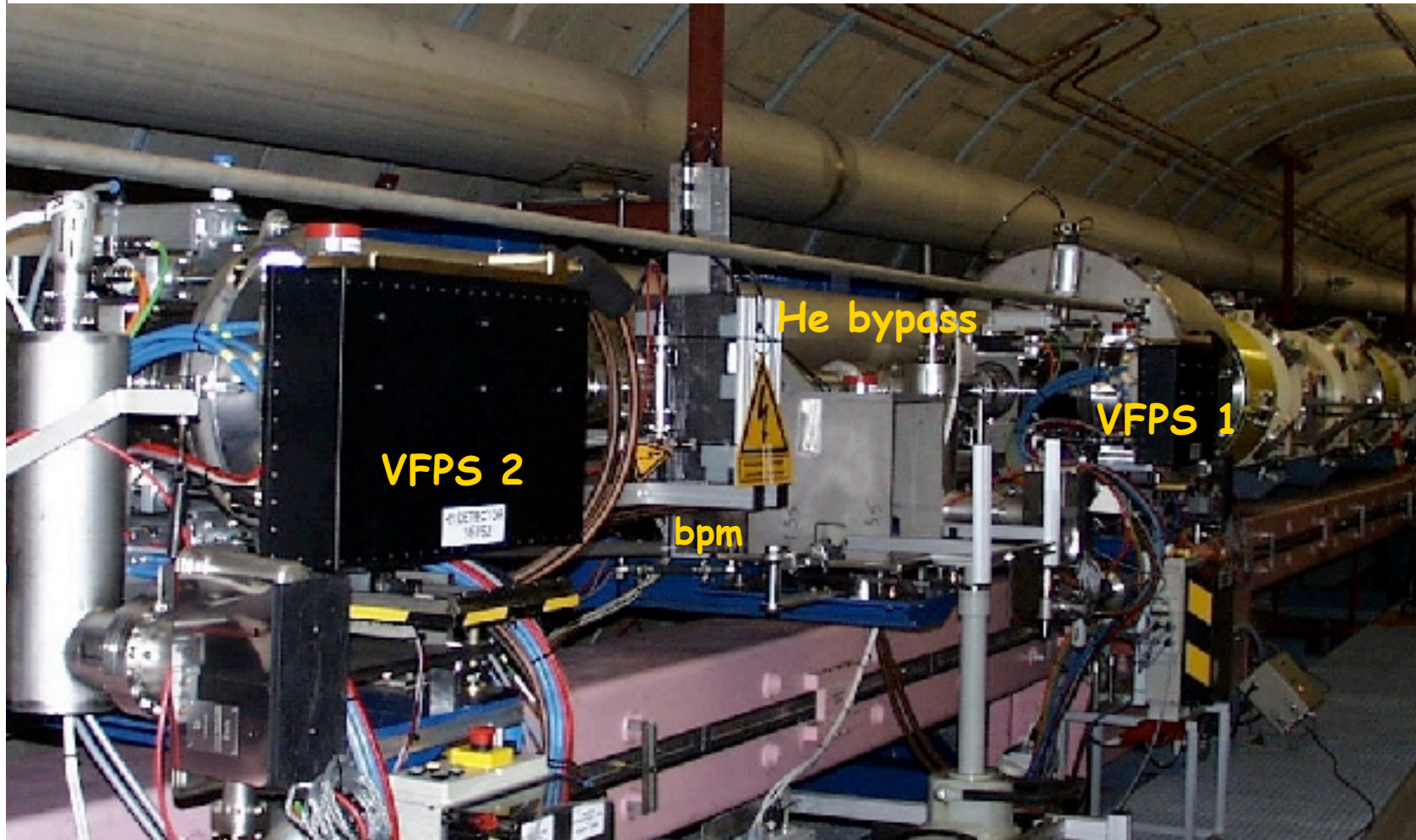
- **Why are we interested in further data?**
- **Why does H1 insist on the HERA II programme to be realised?**
- Discovery machine at the energy frontier (LQ,LFV,FCNC..) complementary to Tevatron and beyond LEP2
- Beauty Structure of the Proton
- Chiral structure of SM and Parity Violation at 10-18m
- Low x: very high precision tests + development of QCD (incl + final states)
- Nature of Diffraction related to Confinement
- High x & best measurement of the strong coupling constant - gluon density?
- **HERA is the only running collider in Europe for the next 6 years**

## Meeting of the Physics Research Committee on May 8, 2003

The PRC acknowledges the physics results presented and congratulates the Collaboration for the many contributions [26 and 29 talks] submitted to the DIS03. The PRC takes note that the VFPS is installed, the CIP has been repaired and all 5 layers are operational, that part of the BST electronics has been replaced by radiation hard components and that the hardware of the Fast Track Trigger is in place. The PRC also takes note of the comments by H1 that even under optimistic assumptions it appears difficult to complete the improved HERA II programme by the end of 2006.

- Detailed detector review with referee J.Mnich (Aachen)
- Agreement with Chairman (G.Rolandi, CERN) and Directorate to discuss the future prospects after HERA has started this fall

new components: VFPS, BST (u/v), BToF, CIP (5layers), FTT, jetT



$\sqrt{s} = 0..0.5 \text{ GeV}^2$ ,  $x_p = 0.005 \dots 0.02$

→DAQ, reconstruction, movement



## If we want to realise HERA II, we need to take off and reconsider how to operate a running experiment together

- Run start requires highest priority from all involved: note that HERA operation stopped in August 2000 and restarts 3 years later: the situation represents a serious challenge → „failure is not an option“
- Huge work has been done by detector groups - needs to be cont'd and supported also by analysis oriented physicists - enjoy real life  
Software issues deserve similar attention (classification, FT speed)
- cosmic run starts 4.7. → 18.7. shifts, big hopes for CIP trigger
- Requires to define physics goals of DT - focus on most important topics, cross working group boundaries and build on what is known
- Trigger Strategy (cf. HCSC talk to H1 plenary - 8. February 2001)  
combine mbias triggers (most precise!) with track based triggers  
sequential integration of new components (CIP, BSTpad, FTT, jetT)
- Physics WG Convenors met last Friday to realise that we are not yet ready, despite huge efforts, need to improve genuine communication

# Data Quality Tool

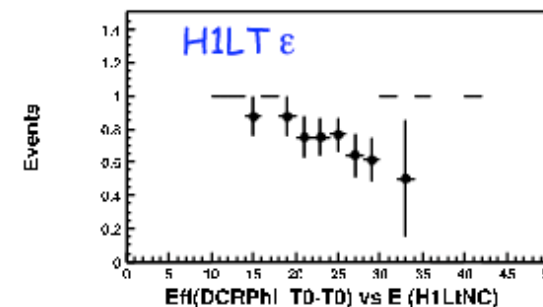
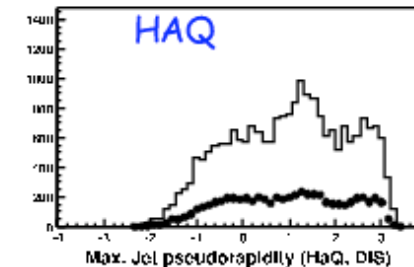
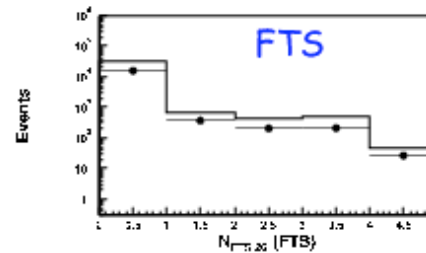
• Bob Olivier, Ingo Strauch,

## Goal

- Provide framework which allows DQ checks for **detector experts** and for **PWG's** in a common tool based on automatically produced histograms
  - OO compatible
  - H1Lt 'tolerant'
  - easy to use (templates for subdetectors/PWGs are provided)

## Functionality

- plain histograms
- efficiencies
- trends / event yields vs
  - time
  - luminosity
  - polarisation
- user access from web interface



Develop tool between L4 histograms and the later analysis - weekly meetings (CN/AS)

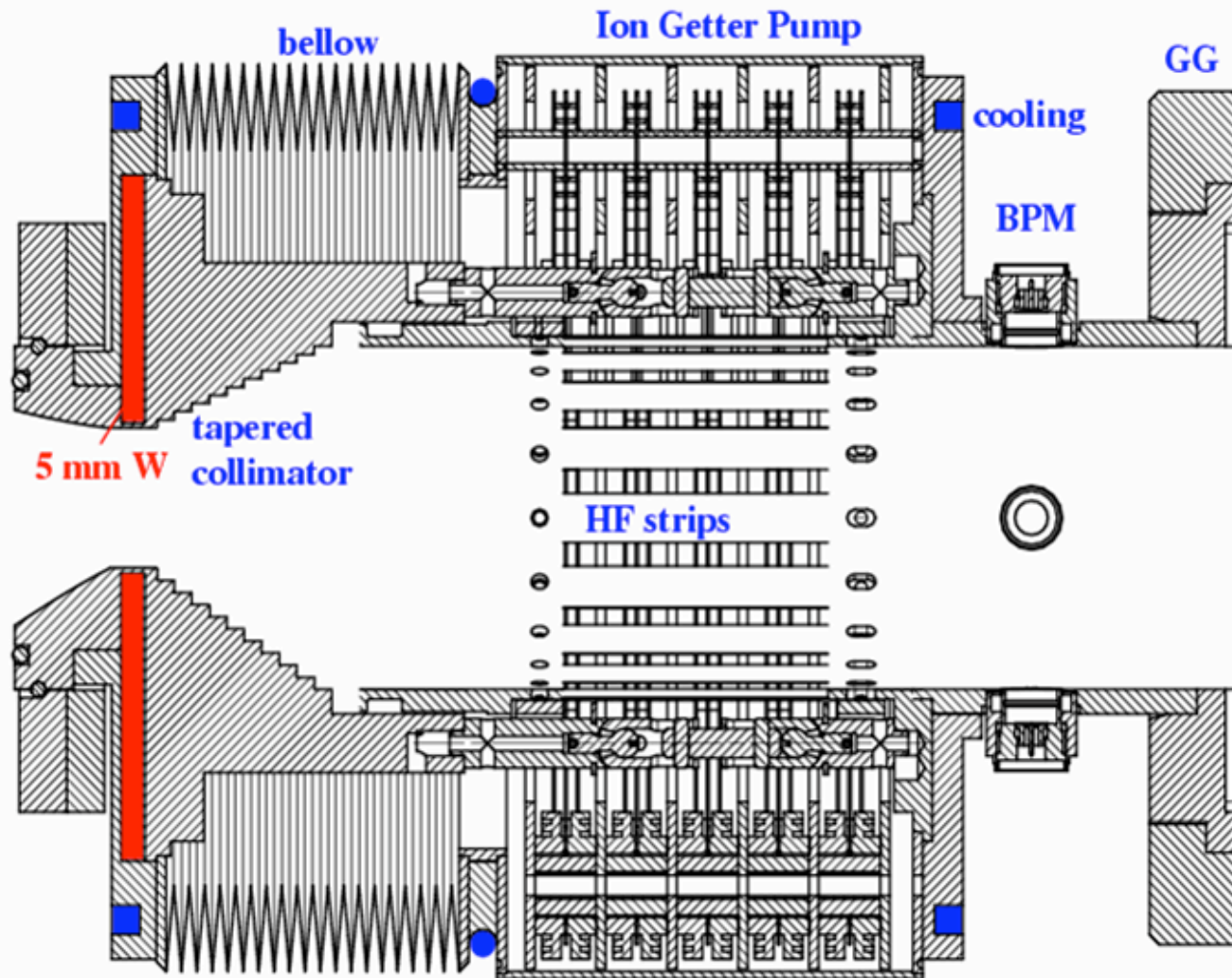
C. Niebuhr

Convenors' Meeting 20.6.03

DQ Status

the detector response needs attention, >10 new components and an unknown background

## various measures to improve vacuum and shielding



- KG: - 3. February 03 : elm SPACAL r/o test on 19.6 which happened on the 20.6
- KG expects beam start on July 7, 2003 at 15.15 - THANKS TO ALL in HALL(s)

## HERA Start-up and Schedule 2003

	Start	$\Delta t / 8h$	End
Start-up with beam p&e	7/12/03 15:00	33	7/23/03 15:00
Machine studies	7/23/03 15:00	33	8/3/03 15:00
12GeV conditioning e	8/3/03 15:00	11	8/7/03 7:00
<i>Maintenance Day</i>	8/7/03 7:00	2	8/7/03 23:00
12GeV conditioning e	8/7/03 23:00	73	9/1/03 7:00
Preparation of Polarization Studies	9/1/03 7:00	3	9/2/03 7:00
Polarization+ 27GeV conditioning	9/2/03 7:00	6	9/4/03 7:00
<i>Maintenance Day</i>	9/4/03 7:00	2	9/4/03 23:00
Polarization+ 27GeV conditioning	9/4/03 23:00	18	9/10/03 23:00
Prepare Luminosity Run	9/10/03 23:00	26	9/19/03 15:00
Luminosity Run	9/19/03 15:00	26	9/28/03 7:00
<i>Tag der offenen Tuer</i>	9/28/03 7:00	3	9/29/03 7:00
<i>Maintenance Day</i>	9/29/03 7:00	2	9/29/03 23:00
Lumirun	9/29/03 23:00	112	11/6/03 7:00
<i>Maintenance Day</i>	11/6/03 7:00	2	11/6/03 23:00
Lumirun	11/6/03 23:00	82	12/4/03 7:00
<i>Maintenance Day</i>	12/4/03 7:00	2	12/4/03 23:00
Lumirun	12/4/03 23:00	37	12/17/03 7:00
Machine studies	12/17/03 7:00	15	12/22/03 7:00

• Luminosity → 19.09.2003  
until 17.12.2003

20 pb<sup>-1</sup> polarised e<sup>+</sup>

100 pb<sup>-1</sup> till ICHEP04





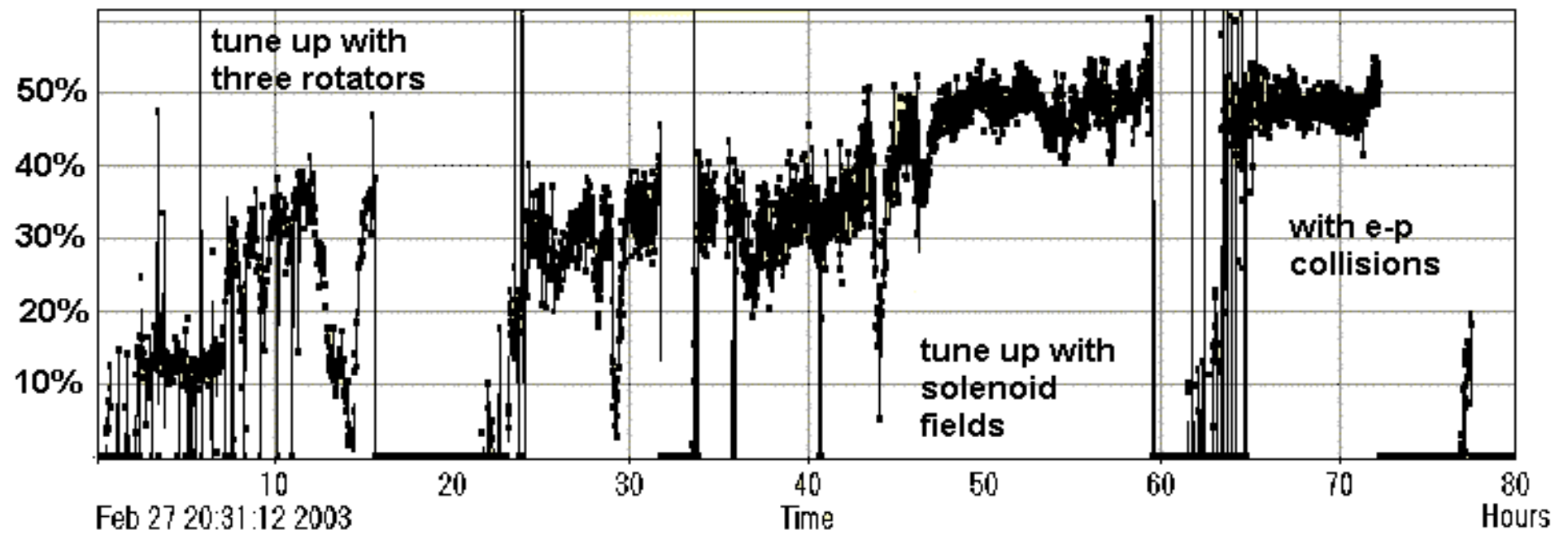


•Marseille 15.-19.9.2003

MK H1 collaboration meeting, 25. 06. 2003

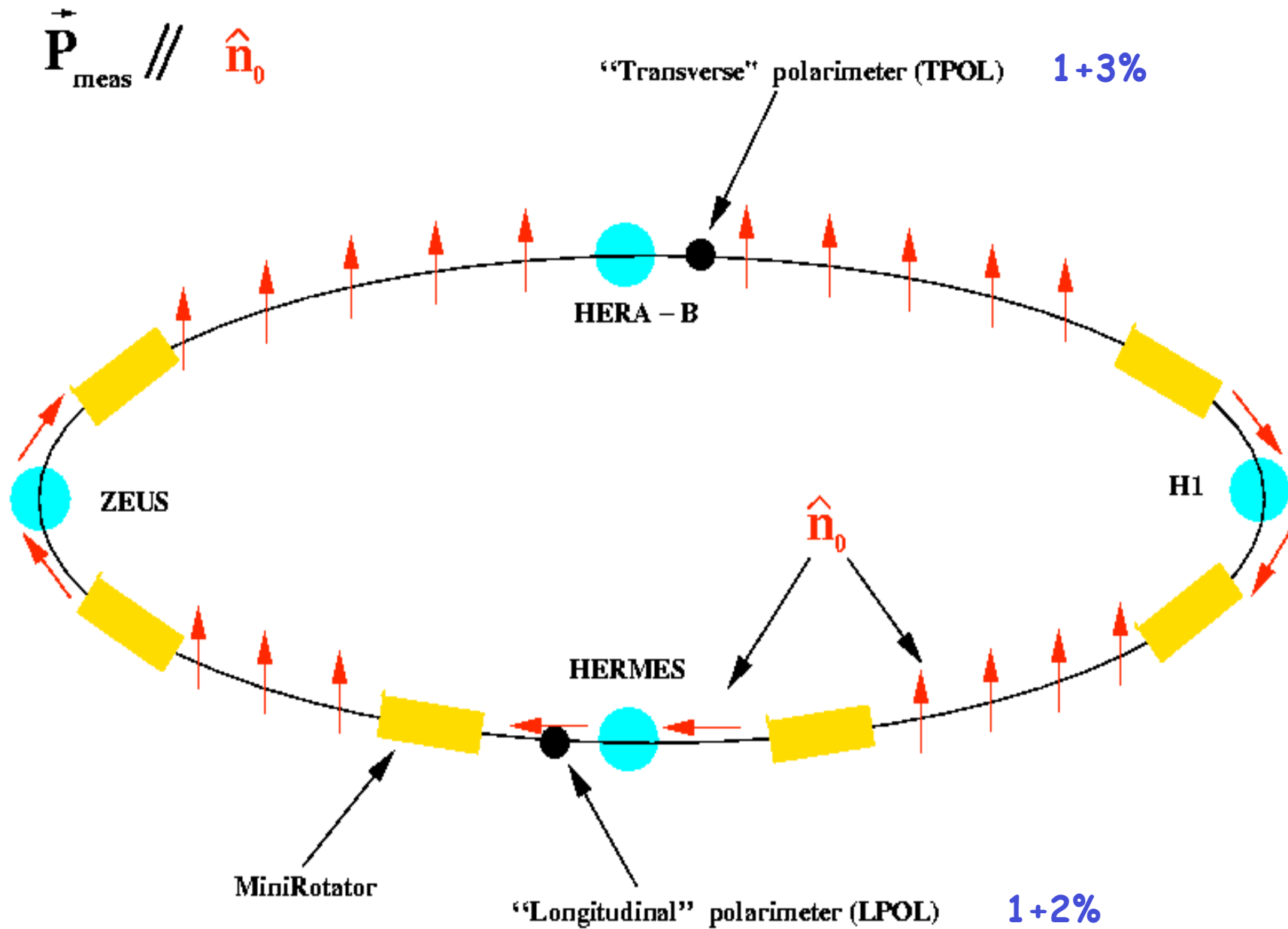
•54 applications so far received

## Polarization

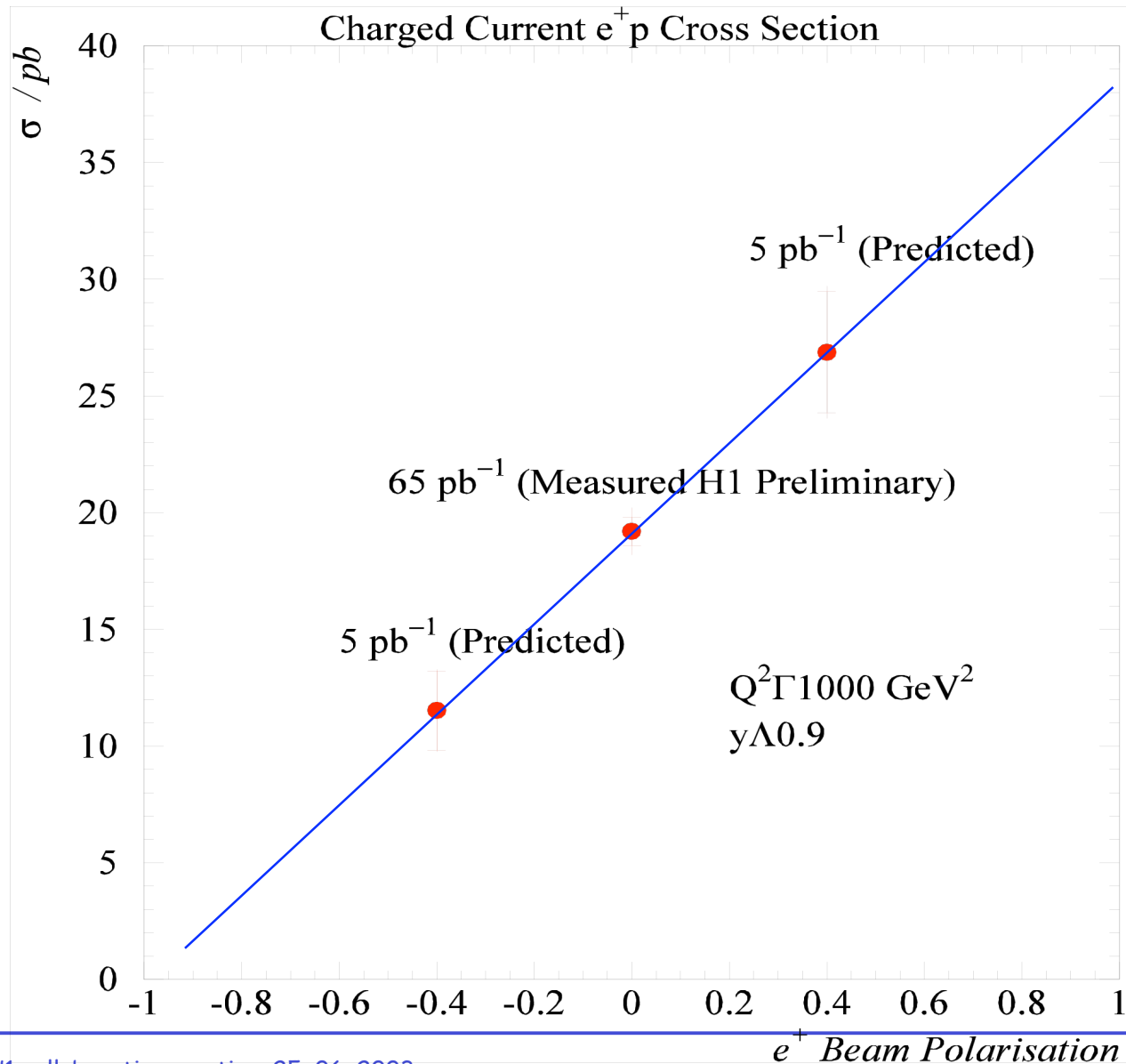


•20mA proton current and 15..8 mA positron current

# HERA electron/positron ring 2001 --



CC - the obvious first goal → DIS 2004 (Strebske Pleso - Kosice)



- Trigger (LAr, CIP)
- LAr and CJC
- Polarisation in ep measurement (T/LPOL)
- Luminosity to 2%

November 2002

Priority was given to backgrounds

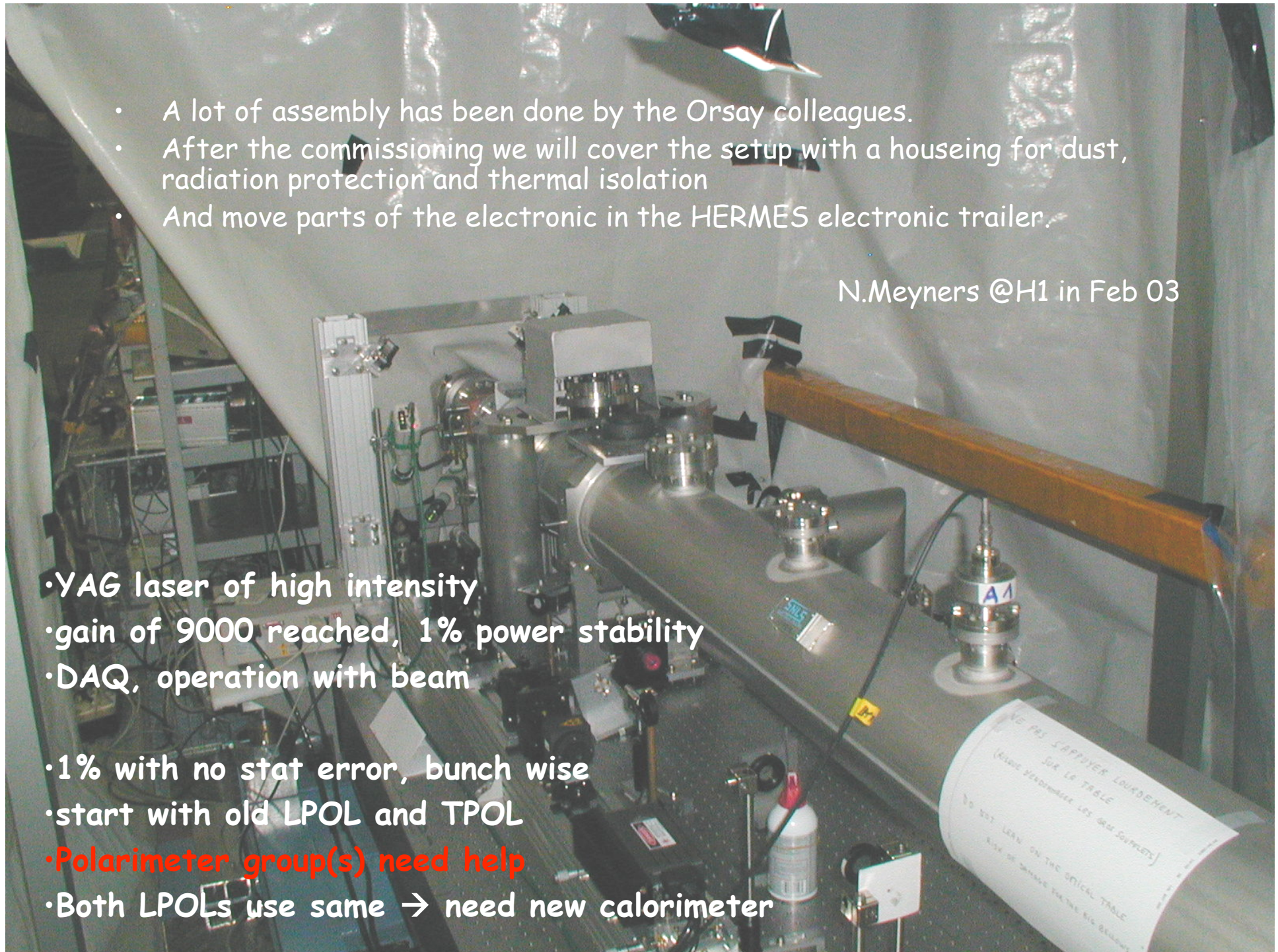
September 2003 go for ep !?!



- A lot of assembly has been done by the Orsay colleagues.
- After the commissioning we will cover the setup with a housing for dust, radiation protection and thermal isolation
- And move parts of the electronic in the HERMES electronic trailer.

N.Meyners @H1 in Feb 03

- YAG laser of high intensity
- gain of 9000 reached, 1% power stability
- DAQ, operation with beam
- 1% with no stat error, bunch wise
- start with old LPOL and TPOL
- **Polarimeter group(s) need help**
- Both LPOLs use same → need new calorimeter





After the table feet have been mounted:  
**Cavity Placement** (24.3.03)



Propose  
to H1-CB  
to re-elect  
Daniel Pitzl  
H1 TC  
for 2 years  
Many thanks  
for the past!  
\$ needs  
run coord's

$$\mathcal{L} = \frac{I_e \cdot I_p}{4\pi q^2 N_B f_{\text{rev}} \sigma_x \sigma_y} = \mathcal{L}_{\text{spec}} \frac{I_e \cdot I_p}{N_B}$$

$$\mathcal{L}_{\text{spec}} = 1.8 \cdot 10^{30} / \text{cm}^2/\text{s}/\text{mA}^2.$$

limited by chamber currents.  $\Rightarrow$  Reduce  $N_B$

current limits:

1 mA/bunch, space charge limit at injection.

1 mA/bunch, limited by beam-beam effects.

$N_B$	$I_p^{\text{max}}$ [mA]	$I_e^{\text{max}}$ [mA]	$I_e \cdot I_p$ [mA <sup>2</sup> ]	$\mathcal{L}^{\text{peak}}$ [10 <sup>31</sup> /cm <sup>2</sup> /s]
119	67	32	2100	2.7 (24.2.2003)
119	72	37	2100	3.3 (expected)
174	108	56	6100	4.8 (design)
175	94	44	4100	1.4 (typical 2000)



## changes

- Trigger coordination: H.C. Schultz-Coulon → F.P. Schilling  
with support of Nick Malden and H1
- PWG convenors: R. Gerhards → O. Behnke and A. Meyer  
R. Stamen → L. Favart
- oo: (A. Meyer → C. Diaconu) & J.Katzy
- CVS: P. Thompson, H1DCM: S.Karstensen, DAQ: G.Eckerlin +
- H1 GRID project - for MC production: A. Campbell

## thanks to old and new responsables

- need to strengthen H1SIM: THE chance of the NO oo generation
- MC generator coordination?



H1 back to America: Mexico CINVESTAV → H1  
(Centro de Investigacion y de estudios Avancados del Politchico Nacional)

Mexico City, Gerardo Herrera  
Merida, Guillermo Contreras and students

financed by Mexican „Bmbf“  
join CST work (alignment and operation)  
Fwd jets, hi Q2 charm, charm fragmentation  
promise to ask H1 people to join Mexican meetings...

→ EC supports request to join the H1 Collaboration, to be decided by the CB

Protocol of Understanding with Academy Institute Sofia  
project being worked out to upgrade CTD gas system and join analysis (C.Kleinwort)

Montenegro physicists + students actively involved at DESY Z and MPI

# HERA beyond the high luminosity and low energy programme

March 2003 workshop at Zeuthen with G.Rolandi present

Electron-Deuteron Scattering with HERA - a Letter of Intent  
for an Experimental Programme with the H1 Detector  
→ submitted to the DESY PRC 21st of April 2003

Discussion at St Petersburg of DIS Community with A.Wagner

7./8. May - open presentations of the two LoI's, by  
A. Caldwell - A New Experiment for the HERA Collider  
T. Greenshaw for the LoI on eD with H1

22./23.5. Scientific Council at Zeuthen

11.June Hamburger Abendblatt: Science Forum with Min Buhlmann  
(„Hamburg auf dem Weg zur Weltspitze“ 17.6.03)

The H1 LoI is signed  
by 160 physicists from  
42 institutes from  
3 continents

23 institutes are H1 members

Strong groups from  
Italy, Germany, China, US

The H1 LoI of June 28, 1985  
had 23 institutes out of which  
16 are still in the collaboration

The other LoI is signed by  
representatives from  
22 institutes.

No LoI from HERMES

- <sup>1</sup> I. Physikalisches Institut der RWTH, Aachen, Germany
- <sup>2</sup> Physics Department, Universitaire Instelling Antwerpen, Antwerpen, Belgium
- <sup>3</sup> National Technical University of Athens, NTUA, Athens, Greece
- <sup>4</sup> School of Physics and Space Research, University of Birmingham, Birmingham, UK
- <sup>5</sup> Institut für Theoretische Physik II, Ruhr-Universität Bochum, Bochum, Germany
- <sup>6</sup> Nuclear Physics Laboratory, University of Colorado, Boulder, USA
- <sup>7</sup> Inter-University Institute for High Energies ULB-VUB, Brussels, Belgium
- <sup>8</sup> Enrico Fermi Institute, University of Chicago, USA
- <sup>9</sup> Institute for Nuclear Physics, Cracow, Poland
- <sup>10</sup> Rutherford Appleton Laboratory, Didcot, UK
- <sup>11</sup> Joint Institute for Nuclear Research, Dubna, Russia
- <sup>12</sup> Physikalisches Institut, Lehrstuhl für Teilchenphysik, Universität Erlangen, Germany
- <sup>13</sup> Università di Ferrara and INFN-Sez., Ferrara, Italy
- <sup>14</sup> Istituto Nazionale di Fisica Nucleare, Laboratori Nazionali di Frascati, Frascati, Italy
- <sup>15</sup> Department of Subatomic Physics, Gent University, Gent, Belgium
- <sup>16</sup> DESY, Hamburg, Germany
- <sup>17</sup> Max-Planck-Institut für Kernphysik, Heidelberg, Germany
- <sup>18</sup> Institute of Experimental Physics, Slovak Academy of Sciences, Košice, Slovak Republic
- <sup>19</sup> Department of Physics, University of Liverpool, Liverpool, UK
- <sup>20</sup> Queen Mary and Westfield College, London, UK
- <sup>21</sup> UCLA, University of California at Los Angeles, USA
- <sup>22</sup> Physics Department, University of Lund, Lund, Sweden
- <sup>23</sup> Institut für Kernphysik, Universität Mainz, Mainz, Germany
- <sup>24</sup> Departamento de Física Aplicada, Cinvestav Merida, Yucatan, Mexico
- <sup>25</sup> Institute for Theoretical and Experimental Physics, Moscow, Russia
- <sup>26</sup> Lebedev Physical Institute, Moscow, Russia
- <sup>27</sup> Max-Planck-Institut für Kernphysik, München, Germany
- <sup>28</sup> Jefferson Lab, Newport News, USA
- <sup>29</sup> Department of Physics, Old Dominion University, Norfolk, USA
- <sup>30</sup> LAL Orsay, Université de Paris-Sud, IN2P3, Orsay, France
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- <sup>37</sup> Petersburg Nuclear Physics Inst., St. Petersburg, Russia
- <sup>38</sup> Department of High Energy Physics, Uppsala University, Sweden
- <sup>39</sup> University of Illinois, Loomis Lab., Urbana, IL, USA
- <sup>40</sup> Fachbereich Physik, Bergische Universität Gesamthochschule Wuppertal, Germany
- <sup>41</sup> Yerevan Physics Institute, Yerevan, Armenia
- <sup>42</sup> DESY, Zeuthen, Germany

МЕЖДУНАРОДНАЯ МЕЖПРАВИТЕЛЬСТВЕННАЯ ОРГАНИЗАЦИЯ  
INTERNATIONAL INTERGOVERNMENTAL ORGANIZATION



ОБЪЕДИНЕННЫЙ ИНСТИТУТ ЯДЕРНЫХ ИССЛЕДОВАНИЙ  
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27.05.2003 № 010-16/153

на № \_\_\_\_\_ от \_\_\_\_\_

To Albrecht Wagner, director of DESY  
Siegfried Bethke, chair of the scientific council of DESY

Dear Professors Bethke and Wagner,

This letter is to express the support of the Joint Institute of Nuclear Research for the further operation of HERA beyond the current high luminosity phase, as described in the Letters of Intent of the experimental collaborations led by Allen Caldwell and Max Klein. The physics that will be investigated by these groups is both fundamental and unique to HERA, namely the study of neutron structure in the HERA kinematic range, mapping the parton distributions at both high and low  $x$ , investigating the mechanism of parton radiation, exploring the confinement region and investigating the high density phase of partonic matter in a region in which the strong coupling constant is small. Further, HERA offers the possibility of exploring nucleon spin at high momentum transfers.

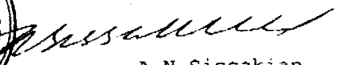
The JINR has made major contributions to the field of deep inelastic scattering over several decades, from the construction of the BCDMS experiment to its contributions to the H1 detector. The JINR directorate strongly supports those Dubna physicists who are making large contributions to the present HERA programme, both in their current efforts and in their attempt to carry the physics of lepton-nucleon scattering forward in the longer term.

Another field in which the JINR and DESY could extend the collaboration in the future may be in the participation of experts for accelerator systems and superconducting magnets in the design and construction of a new injector system, if that was required for the continued operation of HERA.

In our view, HERA remains one of the most important instruments for world-wide HEP, and in particular for HEP in Europe, the exploitation of which deserves the strongest efforts. JINR will be glad to contribute to these.

With best regards,

Sincerely Yours,

Vice-director of JINR, prof.  A.N. Sissakian



In our view HERA remains one of the most important instruments for world wide HEP., the exploitation of which deserves the strongest efforts. JINR will be glad to contribute to these



# •Strong theory support for HERA3

## Letter to the DESY Physics Research Committee and Scientific Council

The HERA collider is a unique facility for studying the high energy limit of QCD. With its superior energy range, polarization of the lepton and potentially the hadron beams and the possibility of accelerating deuterons and heavier nuclei, HERA has the potential to provide data crucial to our developing understanding of QCD. These data cannot be obtained at other facilities and will require a program that extends beyond the currently scheduled  $ep$  running. They include high precision measurements of  $F_L$  and of  $F_2$  in the transition region from the domain of deep inelastic scattering to that of photoproduction, the study of forward jet production over the largest possible rapidity range and measurements with deuterons. These will allow the development and refinement of new approaches to perturbative QCD, the study of non-perturbative effects, the investigation of QCD radiation patterns over an unprecedented range in  $x$  and the completion of the mapping of the longitudinal structure of the nucleon.

Collisions with heavier nuclei will allow the exploration of a new high parton density regime of QCD. New states of matter may appear in this region, such as a saturated “bath” of gluons.

The understanding of spin remains a central problem in high energy physics. HERA running with polarized protons or deuterons would bring a new level of understanding to the outstanding problems of sea and gluon polarization.

The proposed measurements would provide a significant step in the understanding of strong hadronic interactions. This is of fundamental importance, as QCD is a cornerstone of the Standard Model. The measurements are also of great importance for other aspects of high energy particle, astroparticle and nuclear physics. For example, a precise understanding of parton densities is critical for physics at the highest energies and matter densities, from the LHC and heavy ion collisions to high energy cosmic ray showers.

We therefore strongly support further experimentation with the HERA collider beyond the currently planned high luminosity phase.

Signed:

G Altarelli (CERN),  
J Bartels (Univ. Hamburg),  
A Bialas (Jagellonian U., Cracow),  
S Brodsky (SLAC),  
J Bjorken (SLAC),  
M Ciafaloni (Univ. Florence),  
J Collins (Penn State U.),  
Y Dokshitzer (Paris U., VI-VII & St. Petersburg, INP),  
M Drees (Munich, Tech. U.),  
V Fadin (Novosibirsk State U. & Novosibirsk, IYF),  
M Fontannaz (Université de Paris XI, Orsay)  
J Forshaw (Manchester U.),  
L Frankfurt (Tel Aviv U.),  
H Fritsch (Munich U.),

E W N Glover (Durham U.),  
R Godbole (Bangalore, Indian Inst. Sci.),  
K Golec-Biernat (DESY)  
G Gustafson (Lund U.),  
G Ingelman (Uppsala U. & DESY),  
R L Jaffe (Massachusetts Institute of Technology),  
A Kaidalov (Moscow, ITEP & Durham U.),  
V A Khoze (Durham U.),  
V Kim (St. Petersburg, INP & CERN),  
R Kirschner (Leipzig U.),  
B Kniehl (Hamburg U.),  
G Kramer (DESY),  
M Krawczyk (Warsaw U.),  
J Kwiecinski (Cracow, INP),  
E Laenen (NIKHEF & Utrecht U.),  
G Levin (Tel Aviv U.),  
L Lipatov (St. Petersburg, INP),  
L Lönnblad (Lund U.),  
U Maor (Tel Aviv U.)  
G Marchesini (Milan Bicocca U. & INFN, Milan),  
A Martin (Durham U.),  
L McLerran (Brookhaven),  
Al Mueller (Columbia U.),  
O Nachtmann (Heidelberg U.),  
W van Neerven (Leiden U.),  
F Olness (Southern Methodist U.),  
R Peschanski (Saclay),  
D Ross (Southampton U.),  
M Ryskin (St. Petersburg, INP),  
G Salam (Université de Paris VI-VII),  
E De Sanctis (Frascati),  
G Schierholz (DESY),  
T Sjöstrand (Lund U.),  
J Smith (Yang Institute for Theoretical Physics, Stony Brook),  
H Spiesberger (Mainz U.),  
A Stasto (DESY)  
G Sterman (SUNY, Stony Brook),  
W J Stirling (Durham U.),  
M Strikman (Penn State U.),  
A Szczurek (Cracow, INP),  
O Teryaev (Dubna, JINR),  
W K Tung (Michigan State U.),  
B Webber (Cambridge U.)

## Meeting of the Physics Research Committee on May 8, 2003

The PRC congratulates the proponents for the studies presented in the EoI's describing measurements that would provide a significant step in the strong hadronic interactions. The PRC acknowledges the interest of a high precision measurement of FL, the investigation of the QCD radiation pattern over a wide range of eta, the improved understanding of the parton distribution functions, and agrees that many of the proposed measurements cannot be done at other existing or foreseen facilities. The PRC takes note that the present level of the theoretical understanding of QCD does not allow predictions of the proposed measurements at the level of precision achievable by the experiments. The PRC rates the HERAIII program at lower priority than the Linear Collider Program.

- Two referees Y.K. Kim (Chicago) and E.Reya (Dortmund)
- Long closed session debate with both LoI's represented
- Scientific council May 22 long debate with no LoI represented

•Conditions for an Extended HERA Programme  
(Eckhard Elsen to H1 on 4.10.2001)

- A decision to build a linear collider is significantly delayed
- A convincing scientific case, reviewed and supported by the DESY advisory committees is presented
- A strong user committee is backing the project

If fulfilled it is expected to find external sources of funding the extended programme

Presently the HERA3 project is neither rejected nor supported by the directorate of DESY, in view of XFEL, PETRA3 and TESLA

It is a discussion beyond H1's immediate future but of relevance for our time scales, projects, science, education and European particle physics

30.6.2003 (next Monday) meeting of the two LoI collaborations at DESY  
- LoI's, HERA as a GAN Project, Discussion (3pm in the auditorium) -

before the start  
join the dinner,  
tomorrow near Penny  
at 7pm

