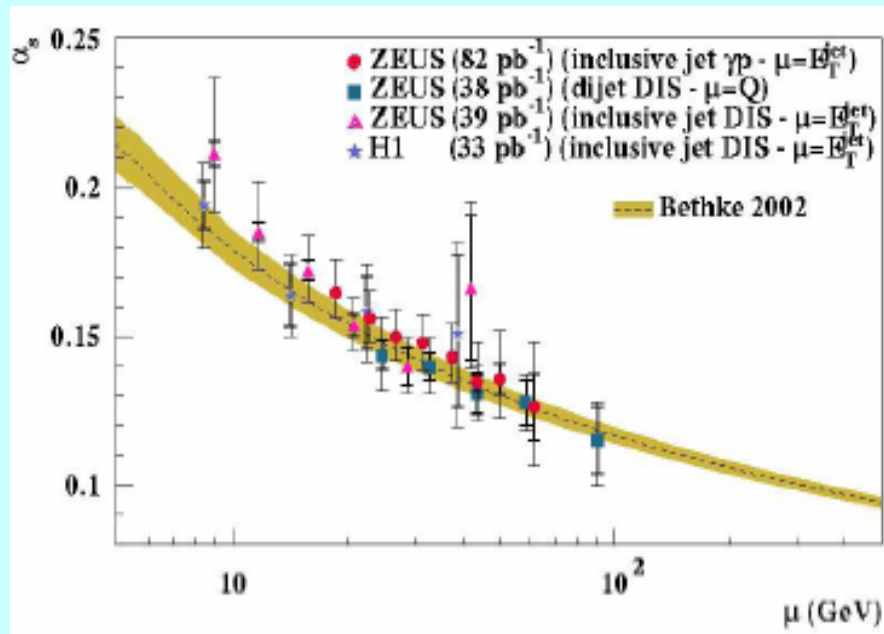
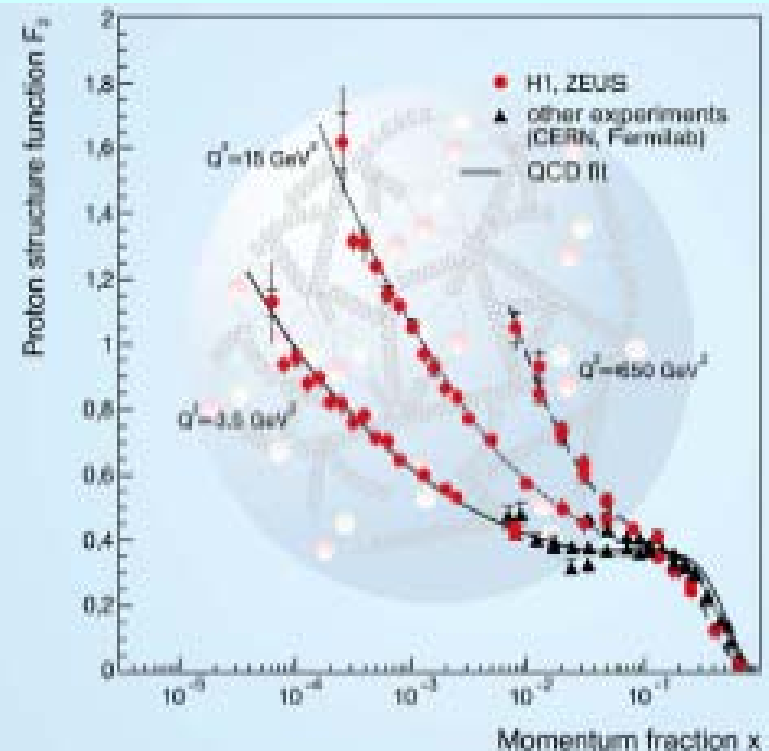


2004 Nobel Price for Physics

D. Gross, D. Politzer and F. Wilczek^{*})
for their contributions to the development of QCD



Running α_s



^{}) The most dramatic of these (predictions), that protons viewed at ever higher resolution would appear more and more as field energy (soft glue), was only clearly verified at HERA twenty years later.*

2004 Nobel Price for Physics

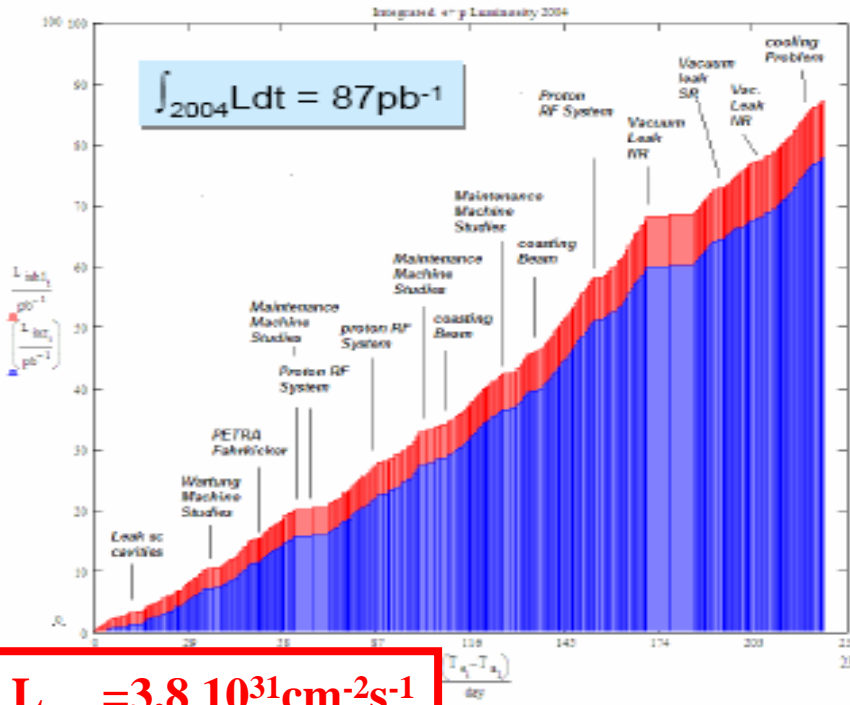
Loops and Legs 2004



HERA performance

2004: **91 pb⁻¹** highest integrated luminosity/year delivered so far

2004 Luminosity Accumulation



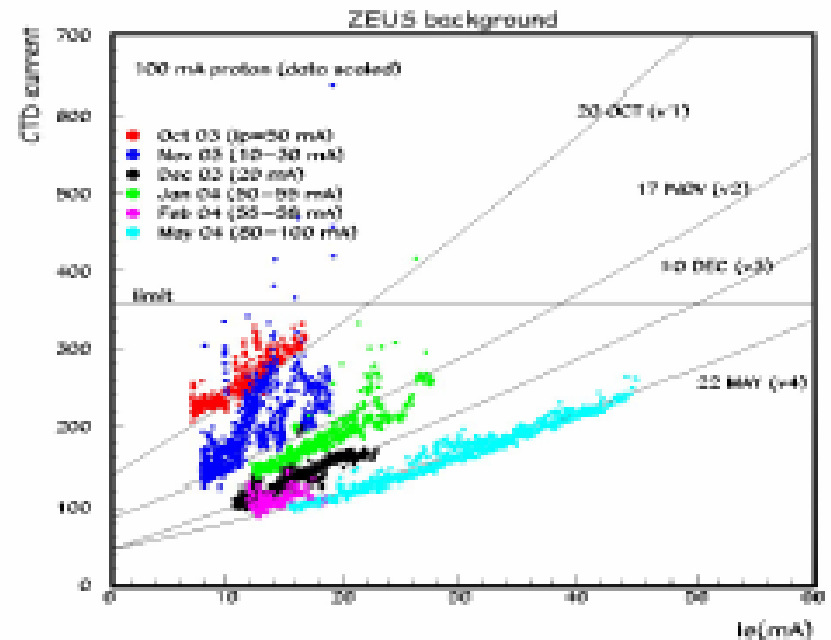
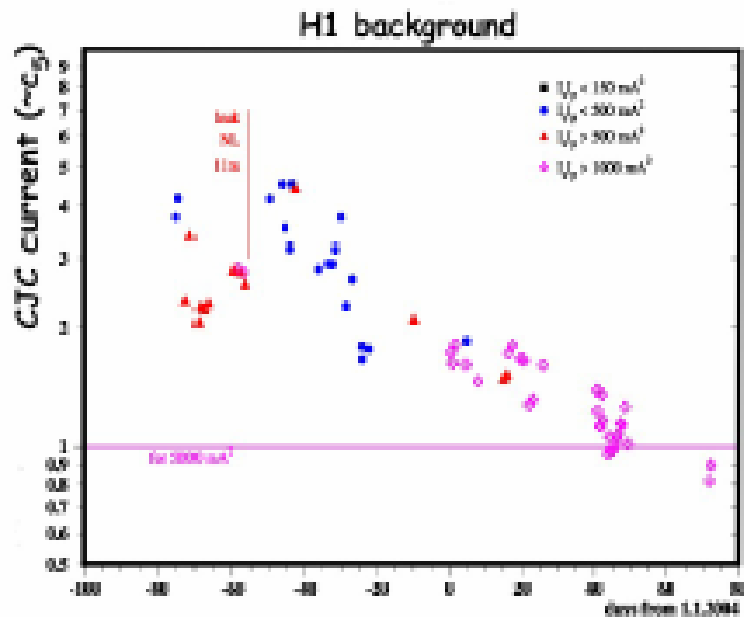
F.Willeke: HERA, 58th PRC

\rightarrow estimate $\sim 0.7 \text{ fb}^{-1}$ can be delivered until mid 2007 by HERAII, about equally distributed between e⁺ and e⁻

H1/ZEUS background

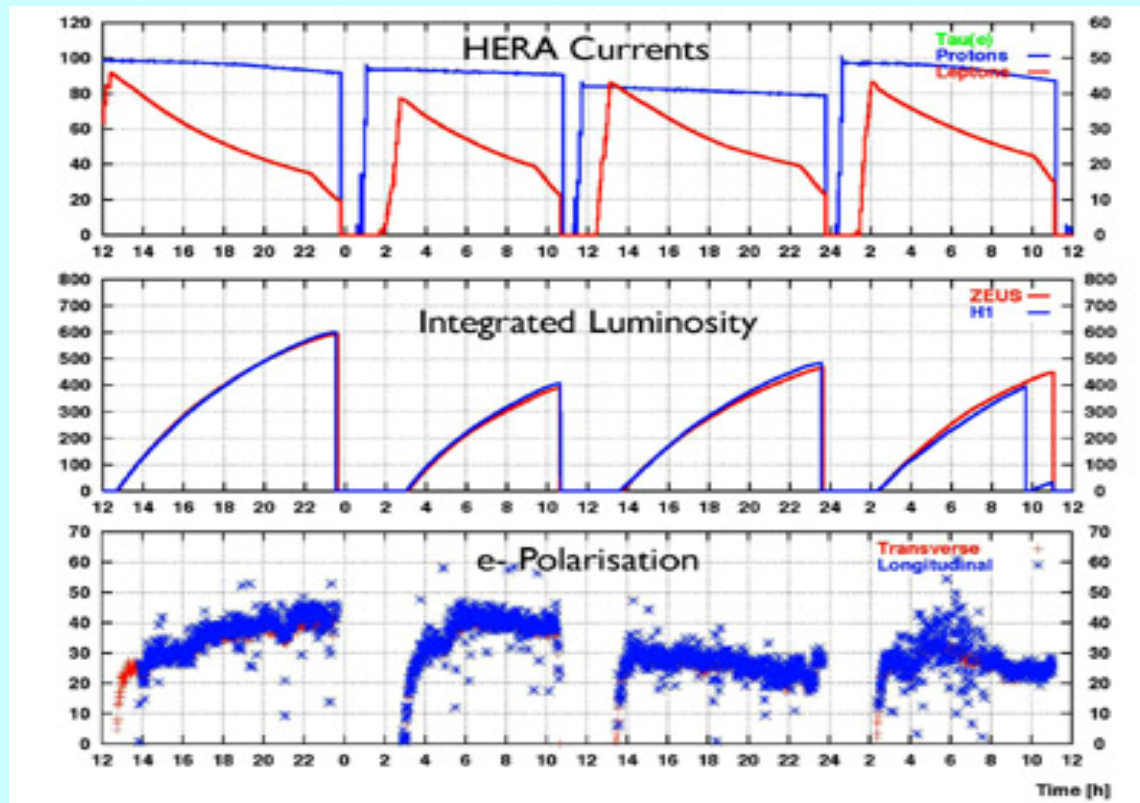
Background in experiments solved → high quality data taken in 2004

recent status at the colliding beam experiments:



Polarization

- HERA reliably delivered polarized positrons: values $O(30-45\%)$

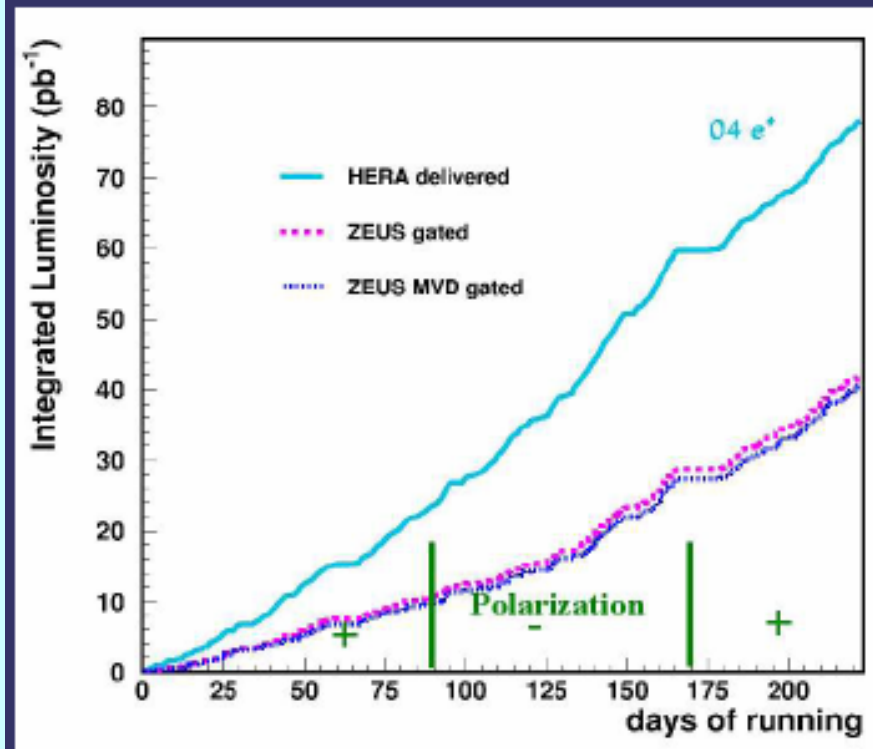


- value of polarization depends on helicity: still to be understood
- still room for improvement: max. value reachable with 3 pairs of spin rotators 50-55%

ZEUS data taking

Data taking in 2004 was quite successful - with a significant increase in efficiency over the running period

Data taking: 2003-2004



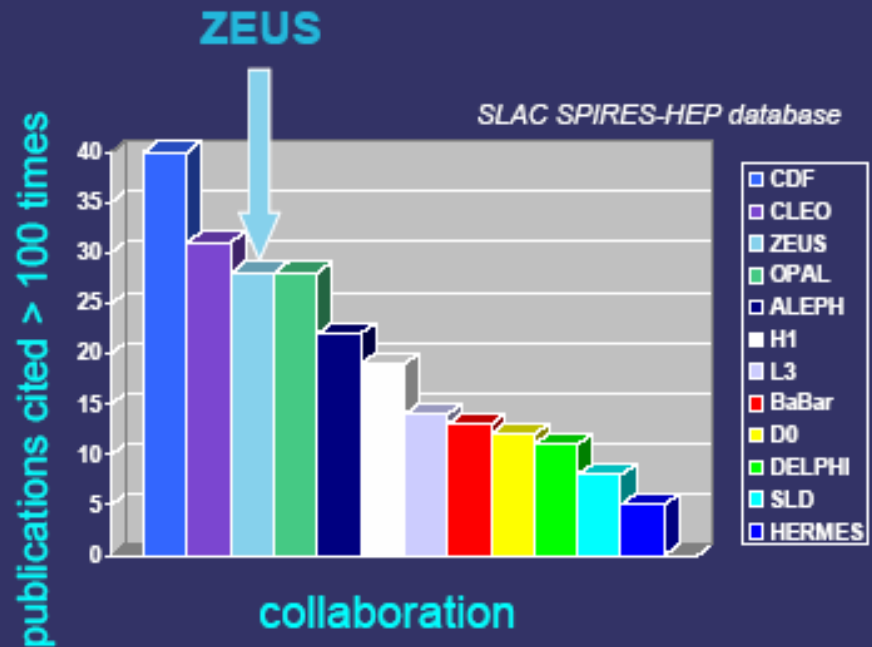
- Total gated: $\sim 45 \text{ pb}^{-1}$
- Gated/HERA delivered $\sim 54\%$
- Nearly all taken data can be used for physics
- All detectors are functional
 - Gated/MVD $> 95\%$
 - Gated/STT $> 95\%$

H1/ZEUS impact

Both H1 and ZEUS continue to have an impressive publication/talks record (e.g. 45 ICHEP 2004, 12 papers in 2004 so far)

Physics output

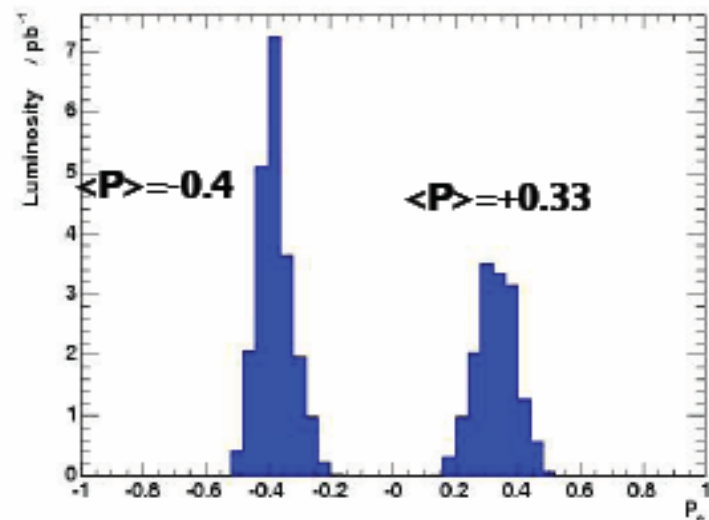
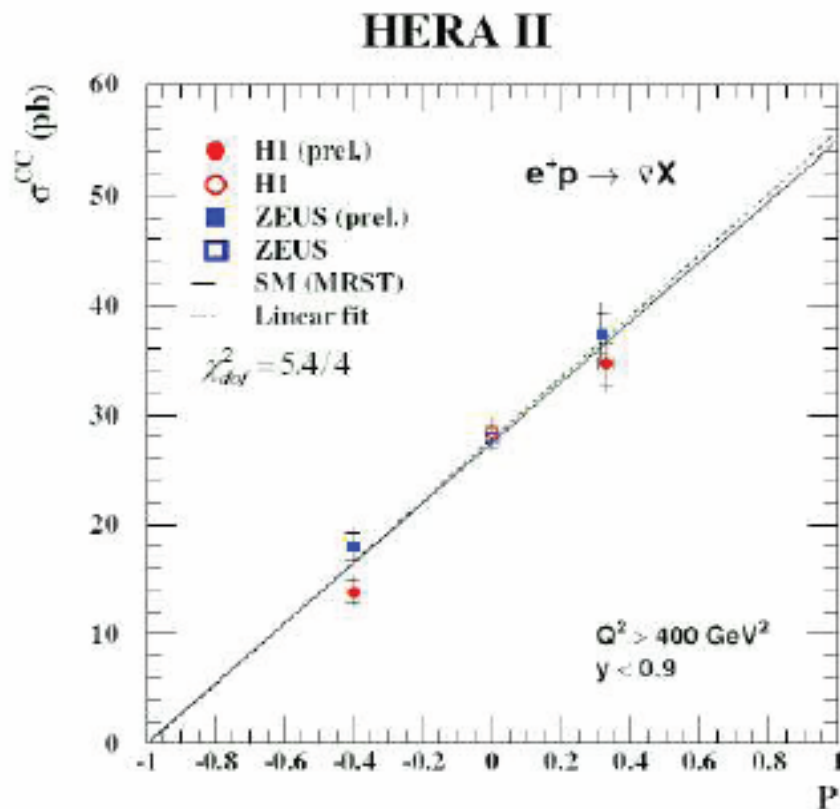
45 papers submitted to ICHEP04
27 papers – new results
9 papers finished in 2004



H1/ZEUS papers are among most cited in literature

2004 results from H1 and ZEUS

CC total cross section versus e^+ beam polarisation



HERA can collide polarised e with protons and flip the helicity

First cross section measurement establish the polarisation dependence

H1+ZEUS $\sigma_{CC}^{tot}(P_e = -1) = 0.2 \pm 1.8(sta) \pm 1.6(sys) pb$

- **No indication for RH currents**

H1

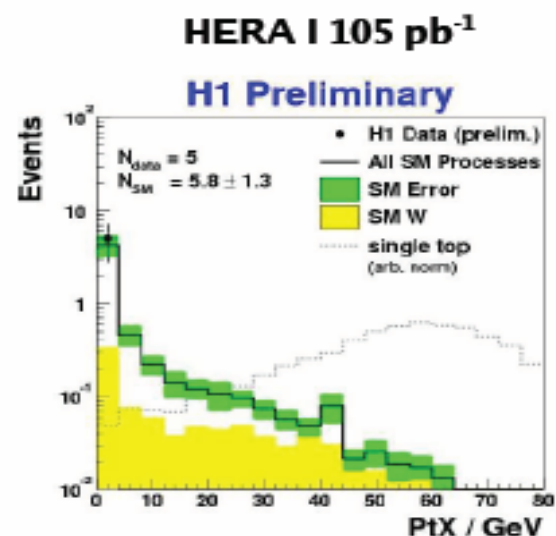
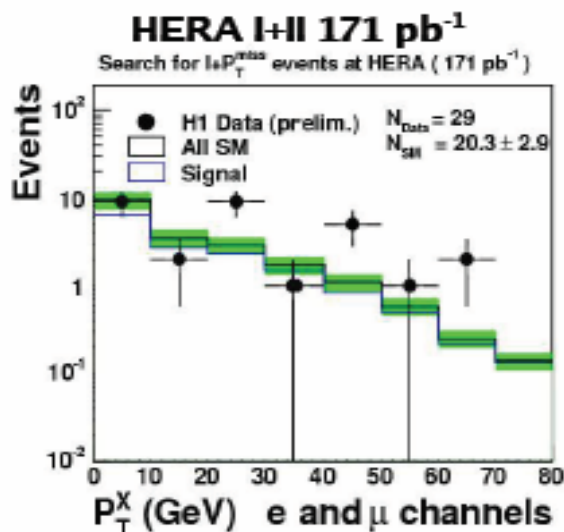
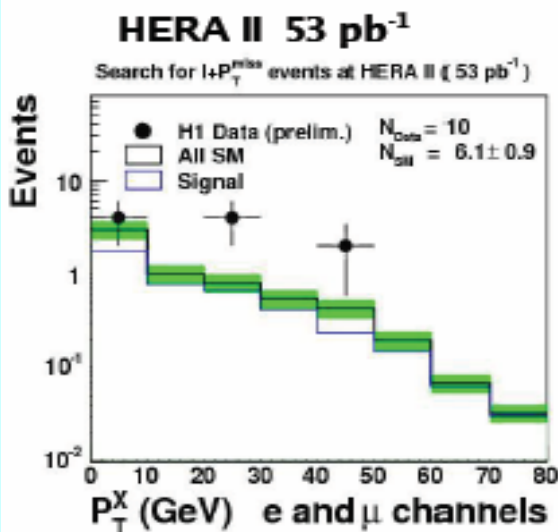
H1 continues to see events with leptons and high missing momentum

I+PTmiss at HERA I+II

1994-2004 L=171 pb ⁻¹	Electron obs/exp	Muon obs/exp/	Tau(105 pb ⁻¹) obs/exp
Full Sample (HERA II)	20/16.1±2.2 9	9/4.2±0.7 1	5/5.1±1.4 --
PTX>25 GeV (HERA II)	10/2.7±0.5 5	6/2.6±0.5 0	0/0.5±0.1 --

Electrons and muons combined

Taus

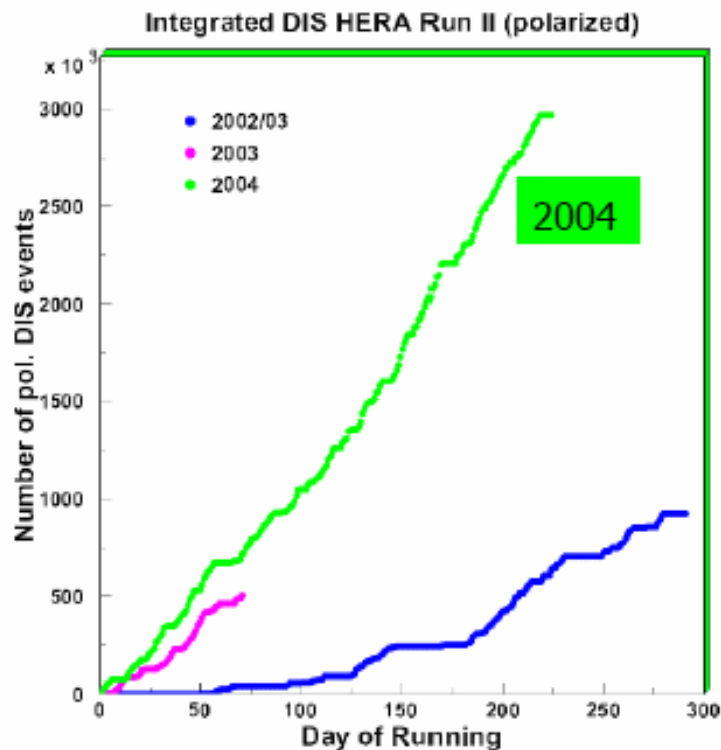


Events also seen at HERA II

HERMES data taking

HERMES has taken excellent data with high efficiency in 2004

data taking 2004



- very successful data taking with *transversely* polarised H target

→ *transversity and friends*
(see PRC56,57 reports)

- high statistic data sets on unpolarised D, Kr, Xe from end-of-fill runs

→ nuclear effects
→ exclusive processes



Delia Hasch

Status report of Hermes

Desy Oct 27/28 2004

PRC58

HERAb

Data taking of HERAB was completed in March 03

work on many physics topics



in 2004 2 publications in Journals, several more well advanced

~40 scientists (many students) work on analysis

plan to complete analysis until the end of 2005

- Upper limit on $BR(D^0 \rightarrow \mu^+ \mu^-)$ (Phys.Lett.B596:173-183,2004)
- Pentaquark searches ($pK_S, \Xi\pi$) (hep-ex/0408048) ← accepted by Phys. Rev. Lett.
- Inclusive $b\bar{b}$ cross section ←
- Upsilon cross section
- Production of ϕ and K^* mesons
- $\psi(2S)$ production ←
- D^+/D^0 production ratio
- J/ψ cross section in MB
- Hard photon production
- Λ^0 polarization
- χ_c production
- A dependence charmonium production
- J/ψ differential distributions
- V^0 and hyperon production
- Jet production

Neutrino Astro-Physics

Amanda data taking in full swing - many new results
sensitivity approaching exciting values

Search for Neutrino Point Sources



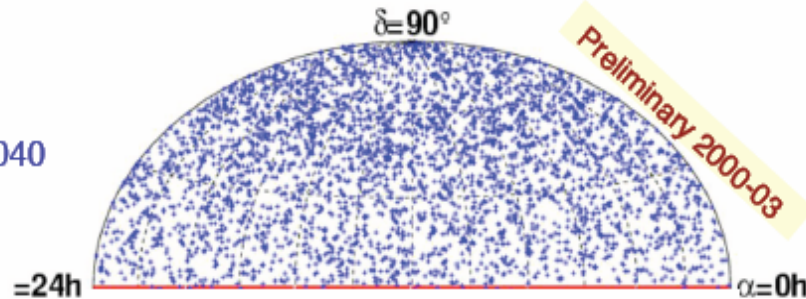
Select upgoing events: maximize $\uparrow\nu$ and minimize $\downarrow\mu$
Optimize cuts in each declination band optimizing for $E^{-2\dots-3}$ signal spectrum
Sensitivity ~independent of direction

Published analyses:

- 1997 data
Astrophys.J. 583(2003)1040
- 2000 data
PRL 92(2004) 071102

New preliminary results with different strategies:

- 2000-01 and 2002 data
- 2000-03 data: 3370 evts in 807 days
(sensitivity ~3 higher as 2000)



No clustering in skyplot observed →
No evidence for steady point sources
(measurement compatible with atmospheric ν 's)

S Schrienerstedt

PRC Open Session, Oct 28, 2004

NuAstro

10

Neutrino-Astrophysics

IceCube under Construction



IceCube

- Full NSF funding since February 2004
- Belgium, Sweden, DESY funded, German universities in 2005
- Deployment of 4200+ Digital Optical Modules on 70+ strings and 140+ DOMs in 70+ IceTop stations between 2005–2010
- This season: install the full chain from **DOM** to **surface electronics**, event builder, trigger, data handling and **reconstruction simulation**, data verification/ analysis
- and **AMANDA integration**

DESY: DOM-DOR-prod., software coord., reconstruction, data simulation, Amanda integration

2 strings → S-pole
DOMs for 2 strings are under test



S. Schuster

PRC O