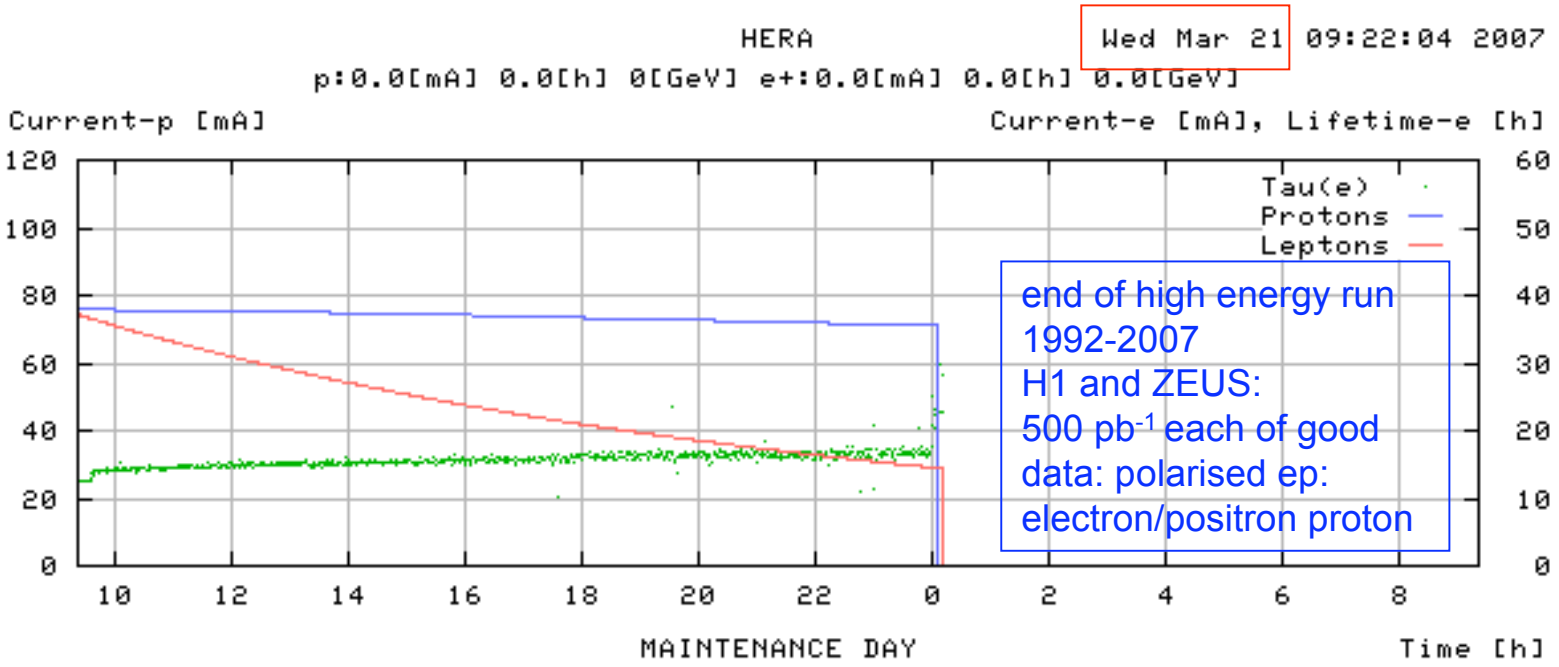
HERA at 27.5 · 460 GeV^2

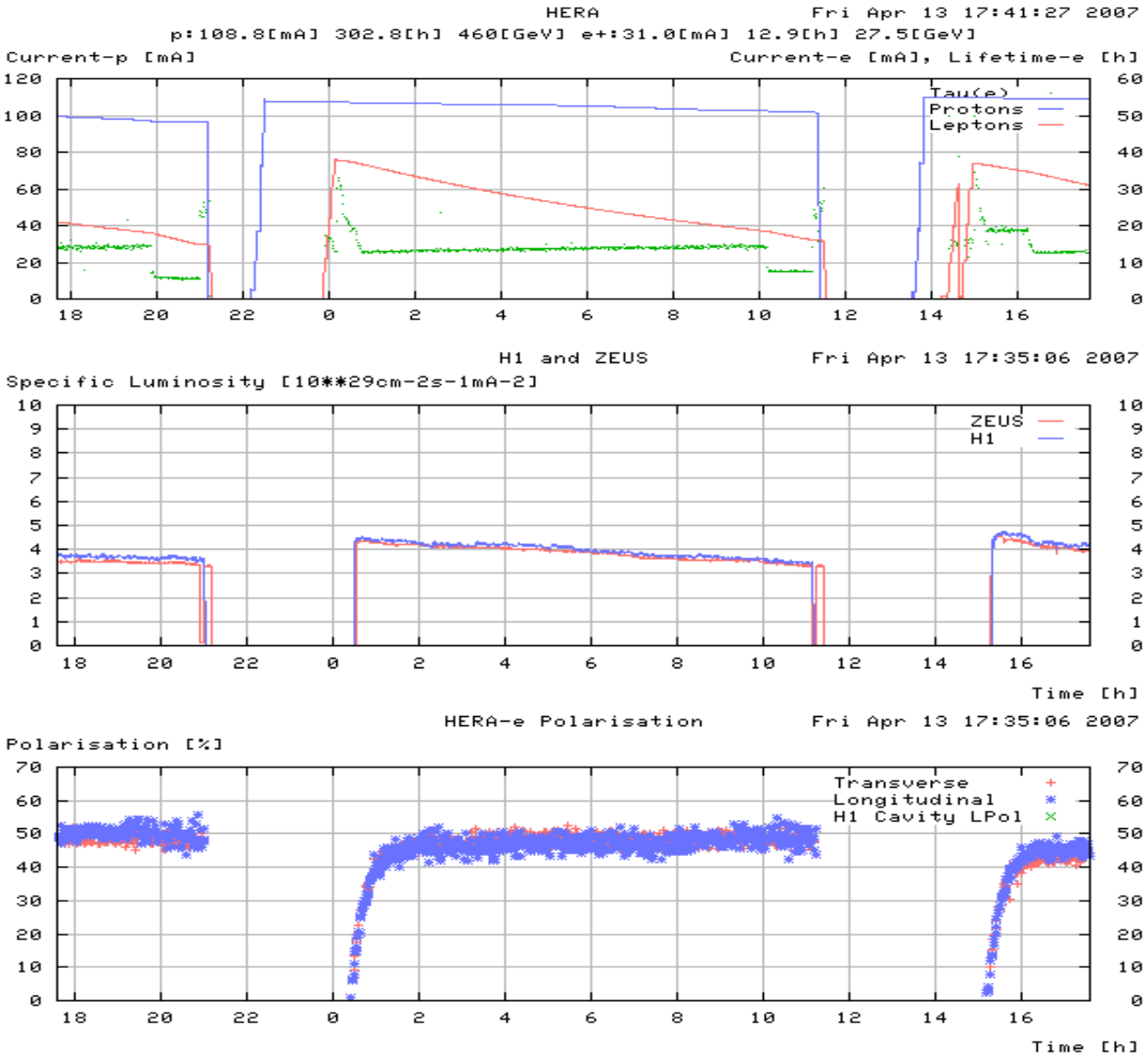
Max Klein (U.Liverpool) - for H1 and ZEUS



since 26.March luminosity operation at 460 GeV - a short status report

HERA end 2.7.2007

Operation at low E_p



High operation efficiency

Specific luminosity as predicted $L \sim E_p^{-2}$

High positron polarisation

More on HERA

Preparations since end of 2006 in a few days of machine studies:

-established low Ep orbit + optics: to keep excursion of beam at 12σ :
reduce the maximum beta function, by enhancing β_0 at IP
- established matched positron beam optics: less focussing in the arcs
to enlarge positron emittance (60^o optics as in HERA I)
- luminosity tests, at injection energies and at high energies

Problems to be watched:

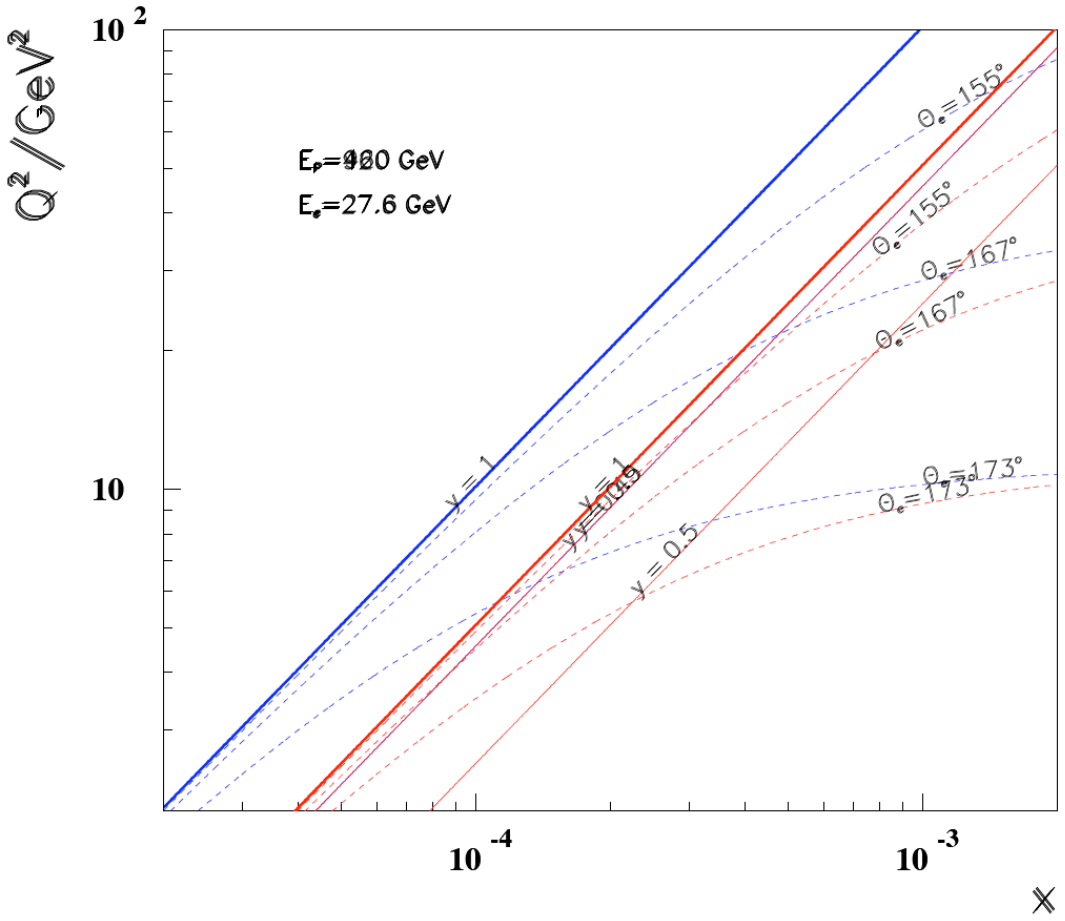
-proton lifetime and beam stability: fine tuning of chromaticity and skew quad's
-coasting beams: built up of DC - AC beam current difference with time
workaround with higher voltages - 180kV instead of 100kV in 52 MHz system
-synchrotron radiation: initially affecting H1 fwd detectors, orbit may be retuned.

Real hardware failures: very few

-cryo cooling of sc IR magnet south (Easter), ..

HERA crew has admiration of all experiments and is wished further luck

Kinematics at 920 and 460 GeV, on 27.6 GeV



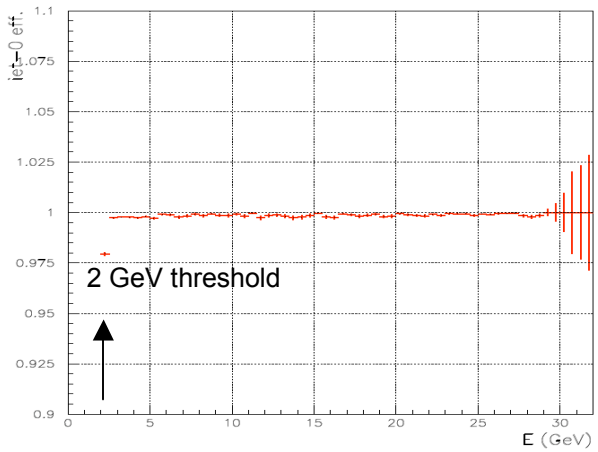
Hi θ from 920 GeV limits low Q^2 acc., 460 GeV extends to lower Q^2

basic goal of the low energy run: collect 10 pb^{-1} of good data at 460 GeV

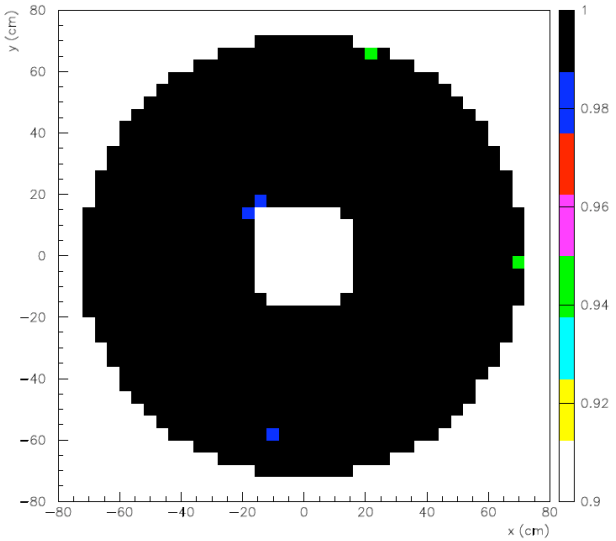
disentangle F_2 from F_L : access and control hi y=1-E'/E_e

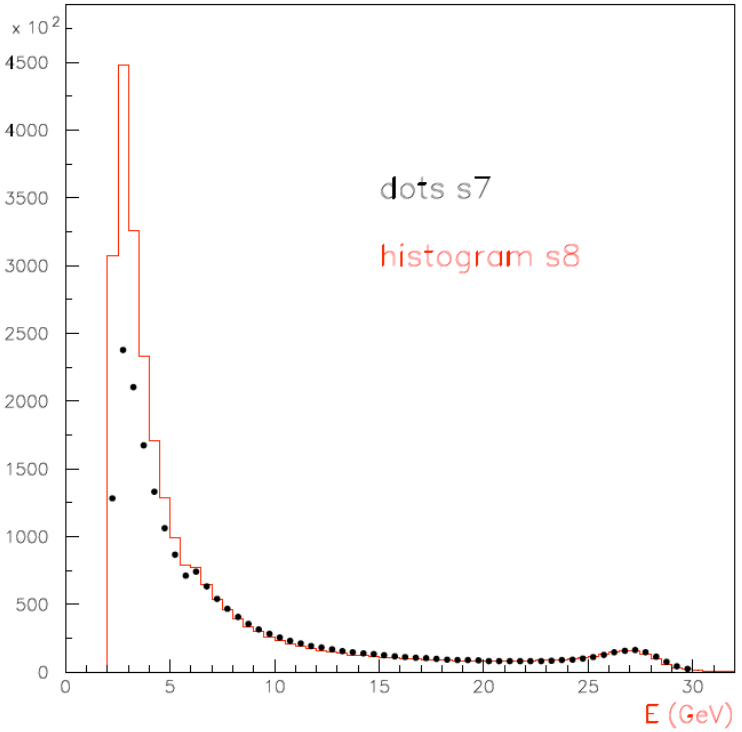
$$\sigma_r = F_2 - F_L \cdot \frac{y^2}{1+(1-y)^2}$$

Trigger on low energy backward scattered positrons (H1)



SPACAL, all ~1000 [-2] cells efficient





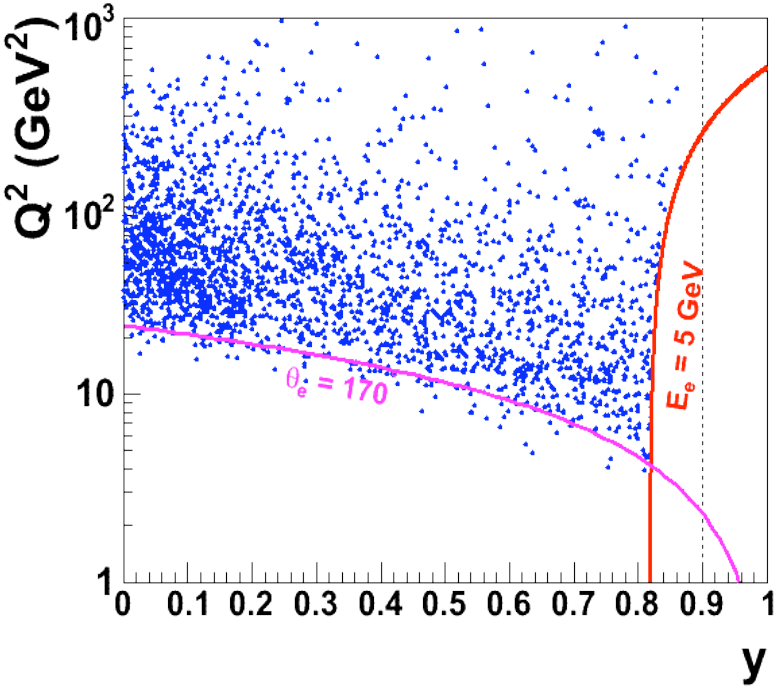
S8 -SPACAL + CIP

S7 -SPACAL + BST pad (topology L1)

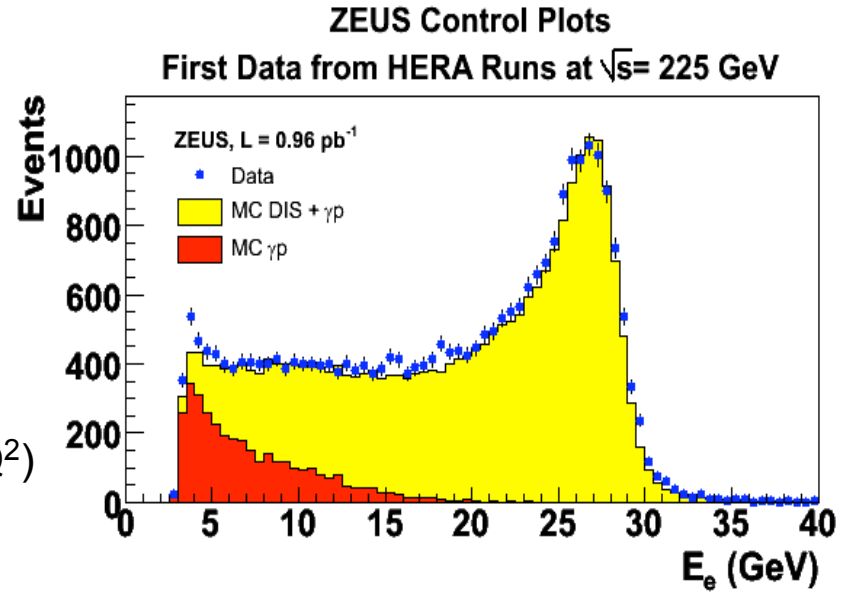
→minimum bias: calo + track

runs unprescaled: note you WANT to collect low energy background

Trigger on low energy backward scattered positrons (ZEUS)

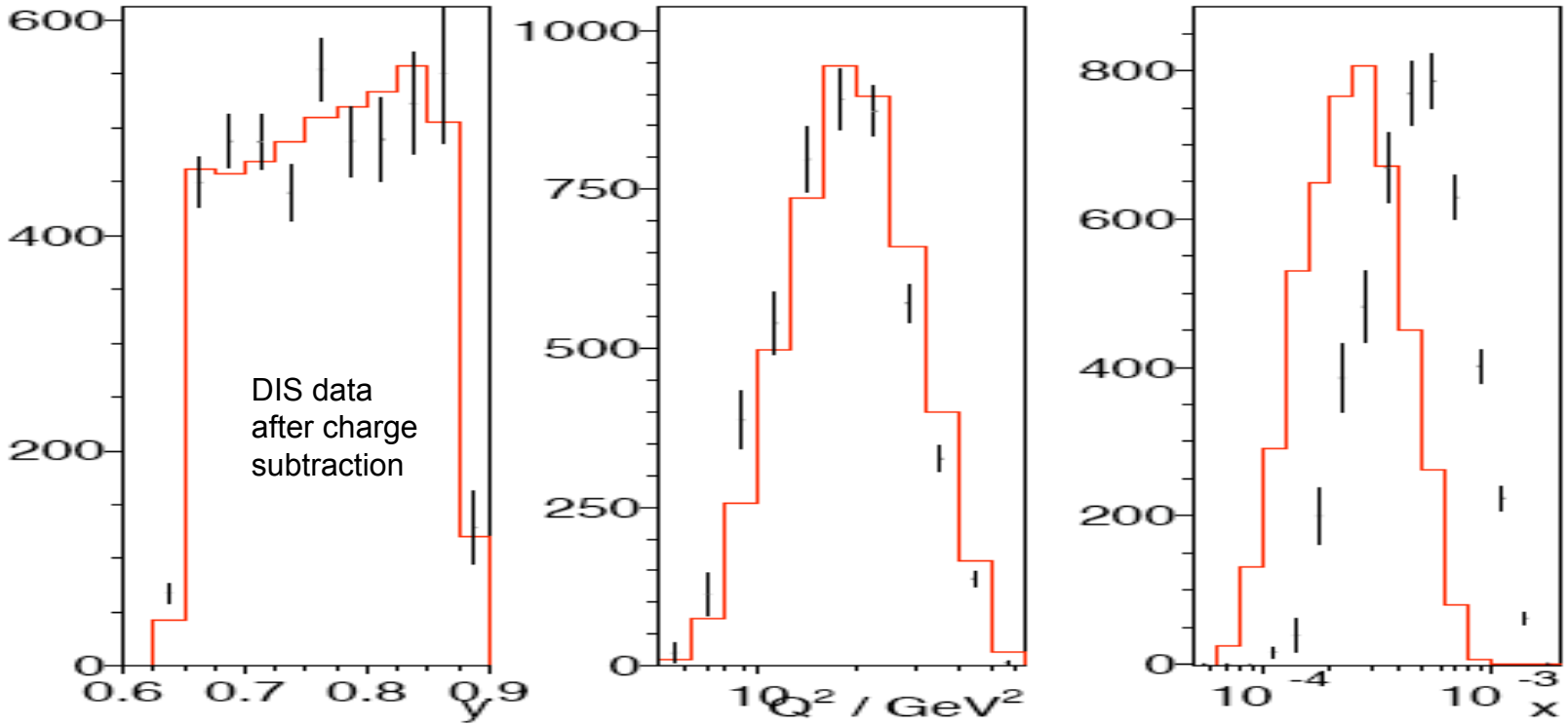


Trigger to low energy:
with some DIS requirements get:



Standard PHYSICS trigger with additional
lower Threshold in RCAL EMC (high y, Lower Q^2)
Rates and bg steadily improving
HV on in all chambers,
No prescales, deadtime below ~2% (as in HER)

Data Studies - Larger Q^2 (CJC) - H1



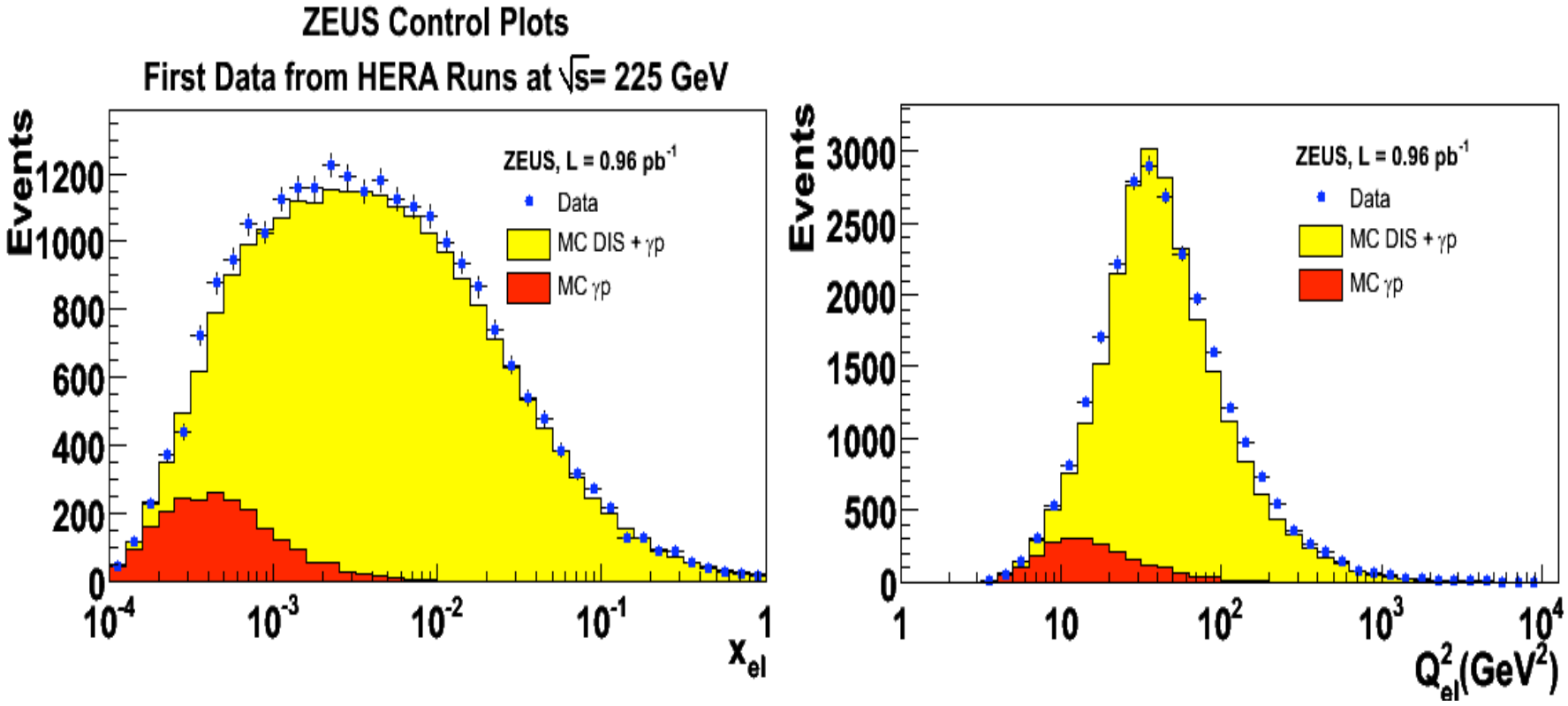
High y, larger Q^2 data from **920** and **460** GeV

$x=Q^2/sy$

Lower energy:
access larger x

Low E_p: vetos and offline filter off - eliminate ~1% source of uncertainty

Data Studies (ZEUS)

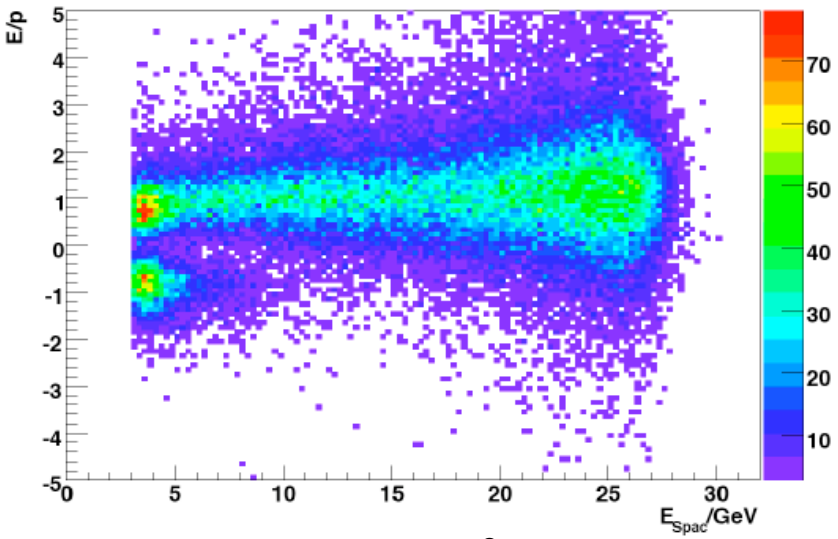


Photoproduction background from Monte Carlo simulation and etagger at 6m [orbit -acc]

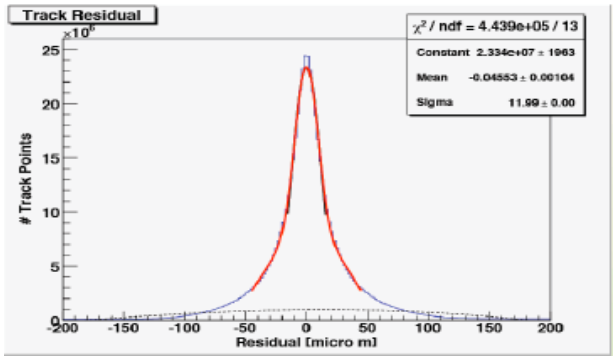
DIS requirements:

P(eID) > 90% and track validation
vertex within 50cm
E-pz > 40 GeV

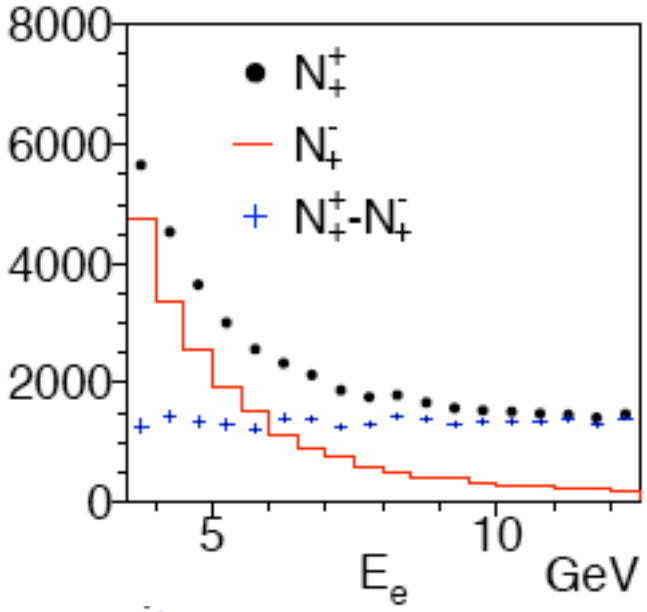
Backward Silicon Tracker - H1

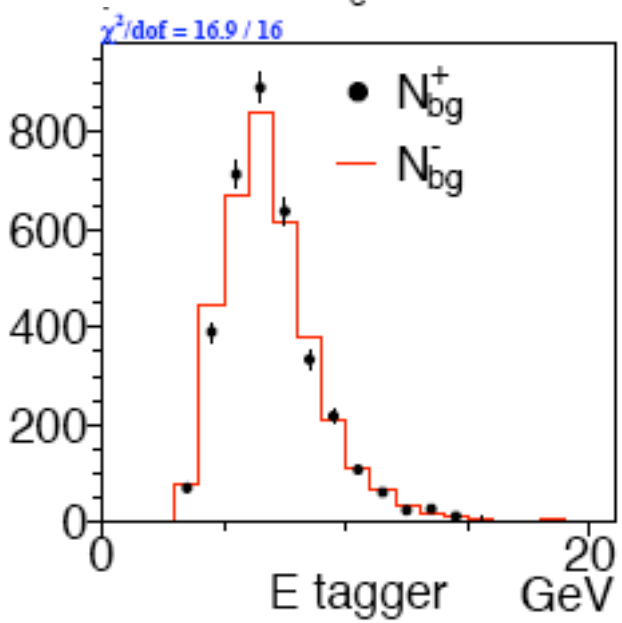


E/p at low radii (low Q^2)



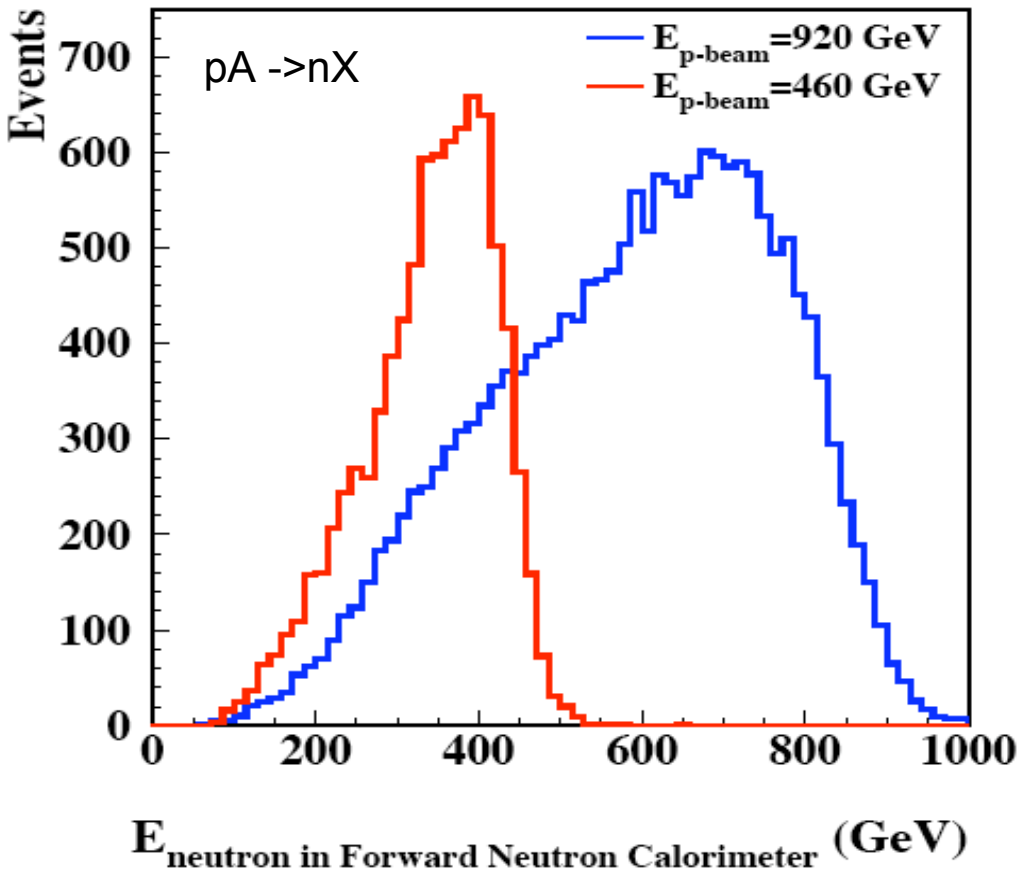
12μm resolution - alignment crucial





Forward Neutron Calorimeter - H1

We indeed run at ~460 GeV:



Vertex factorisation

and π exchange:

MAY: measure

cross section ($z = E_n / E_p$)

and event characteristics

in central detector for

both low and high energy

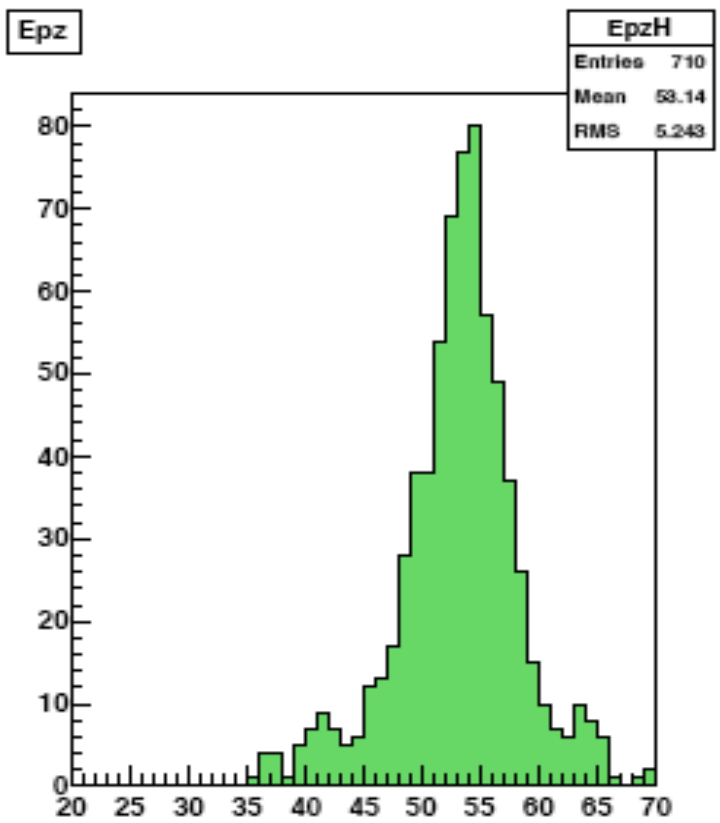
at constant x.

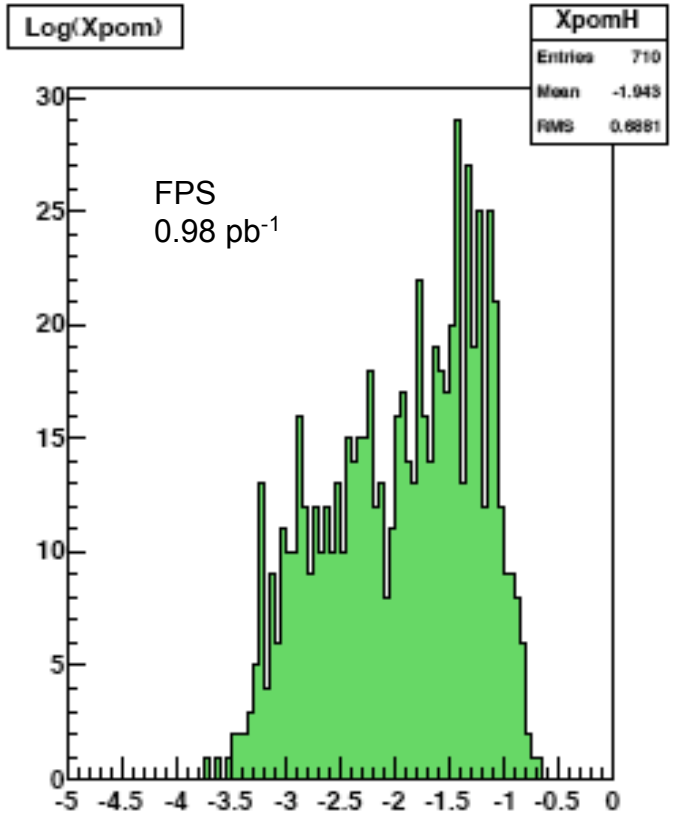
FNC dependent on beam

backgrounds and orbits

ep rate not high - to be seen

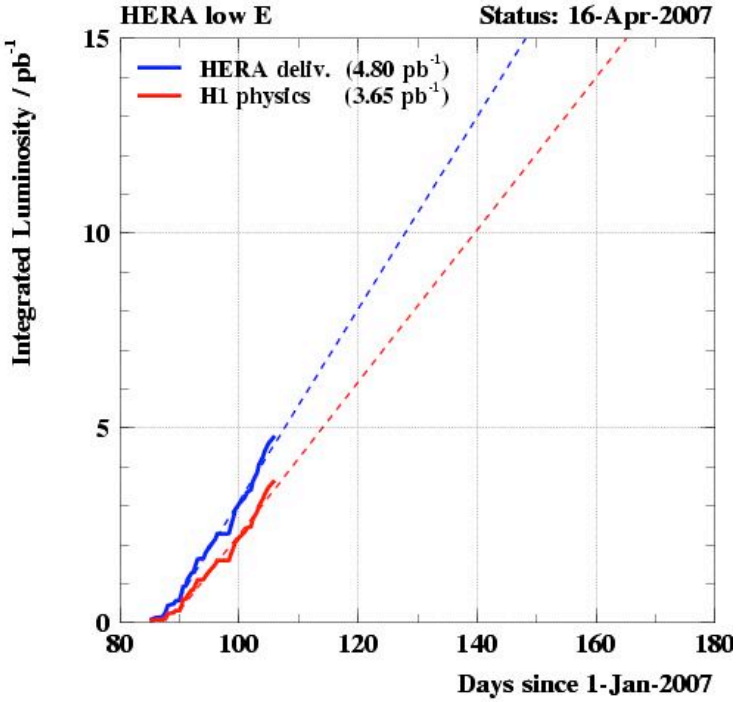
Forward Proton Spectrometers - H1

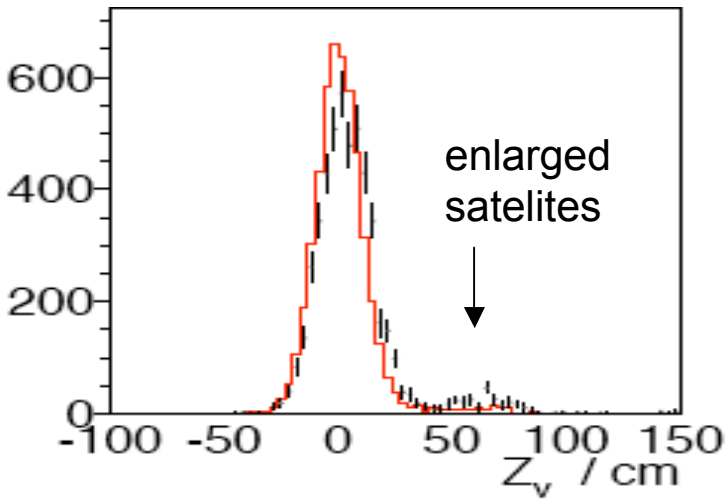




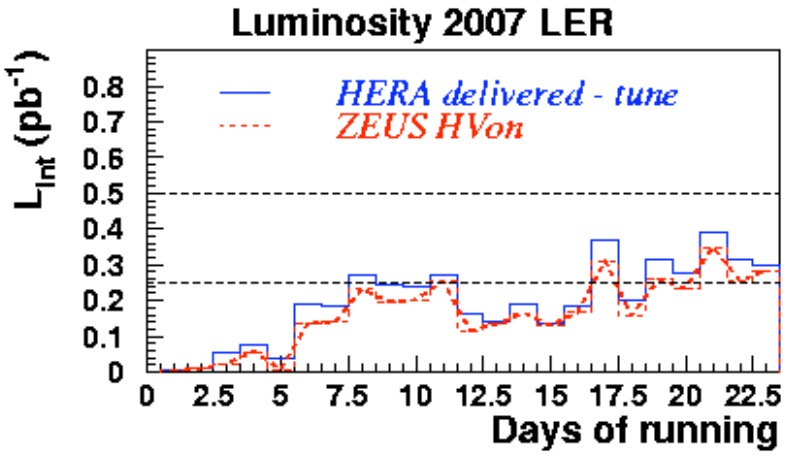
FPS data: measure t slopes and determine LRG/FPS

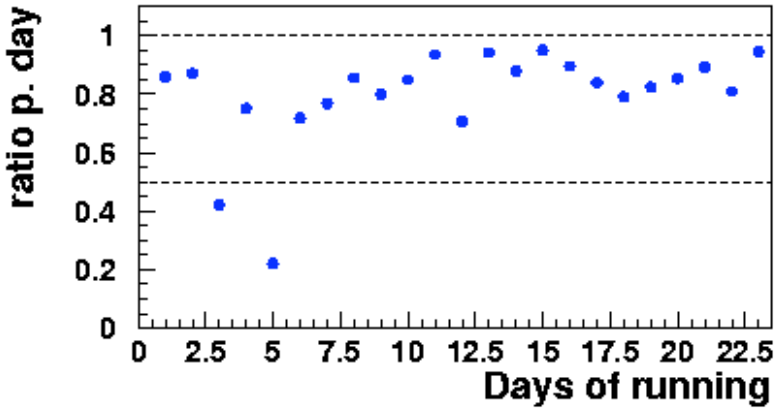
orbit tuning still required for FPS+VFPS and also syn. radiation reduction





Luminosity collected by April 16th





increase of L and ε with t

Summary

The low energy run has started very successfully.
It has already lead to a revival of low Q^2 physics.

The run is also a manifestation of grown trust and
гласность between H1, ZEUS, HERMES and HERA.

Current optimism gives rise to various ideas
about how to spend the last month of data taking.

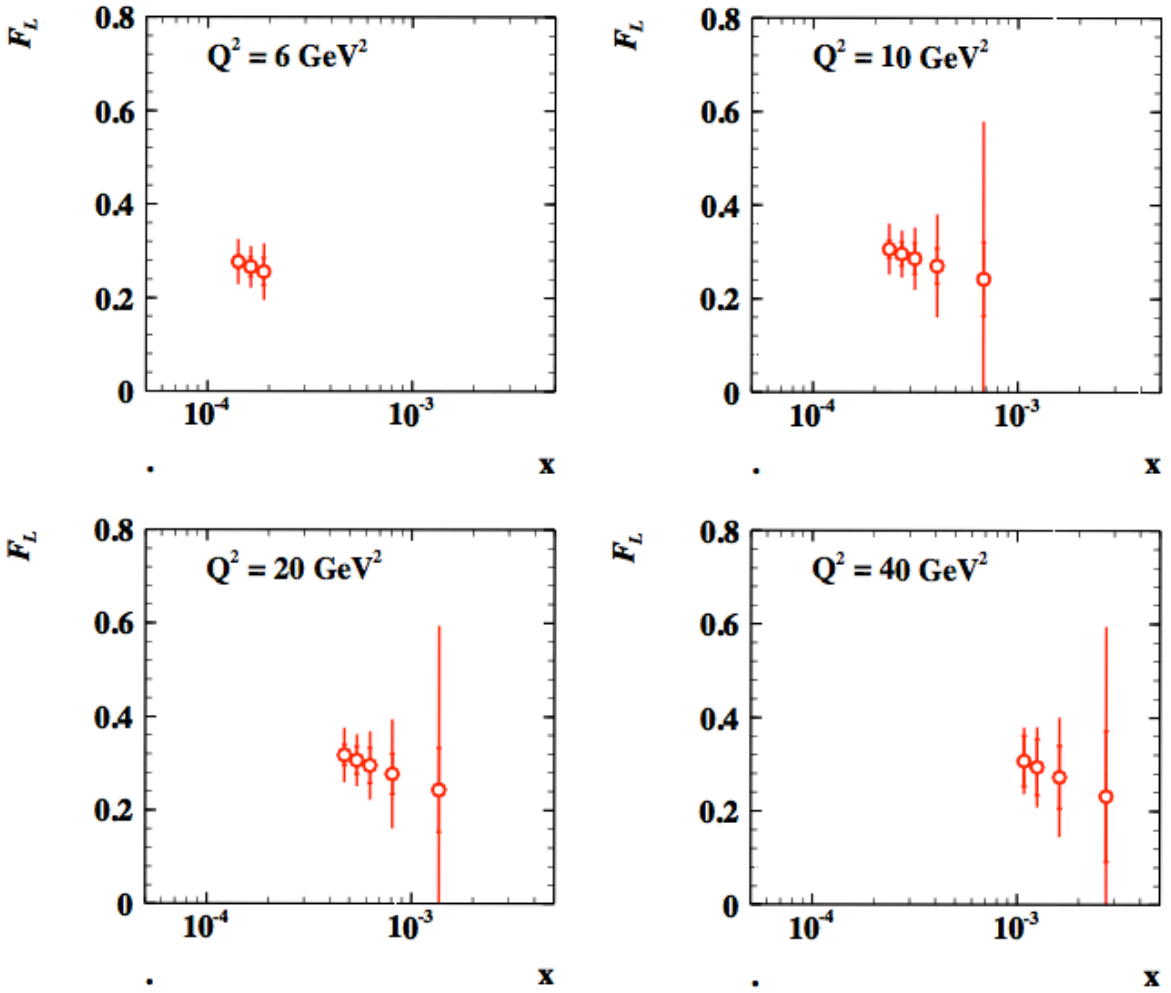
Care is continued to be dedicated to beams
and detectors (e.g. regarding fwd. background).

Don't take the rapid analysis output as a sign for
an easy measurement. The F_L extraction requires
to measure cross sections up to highest y to 2%
accuracy. That will take much more time and effort.

But the prospect looks good.

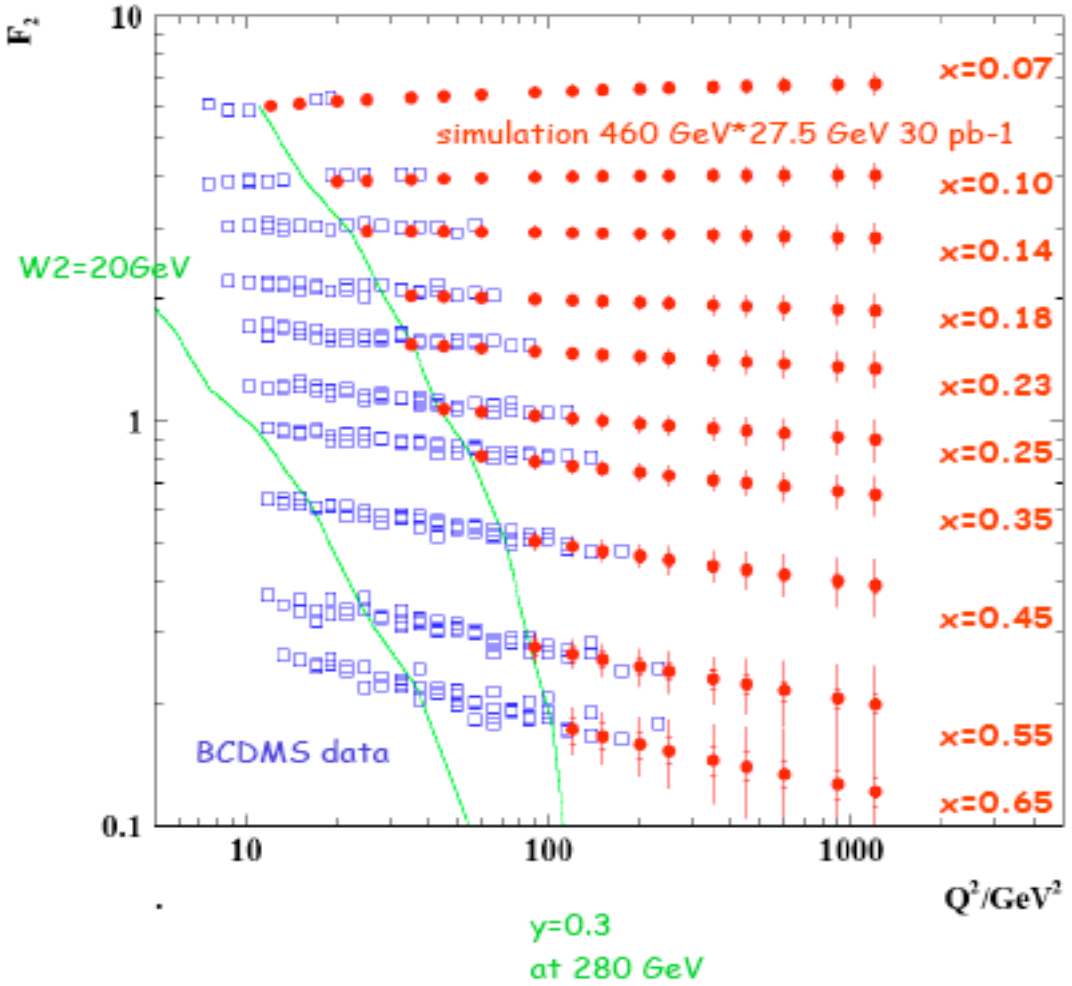
Backup slides

High statistics at 460 GeV

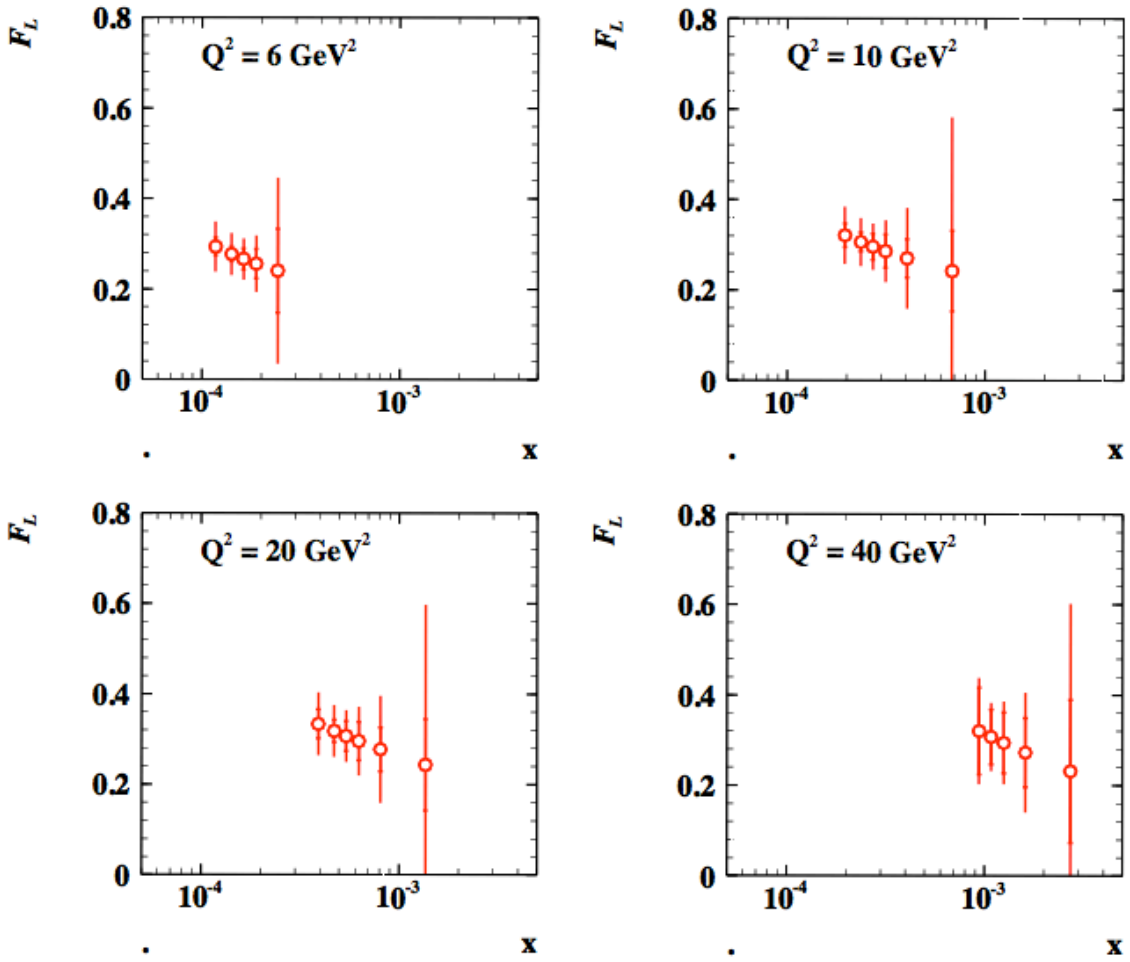


920 GeV 30 pb^{-1}
460 GeV 15 pb^{-1}

F_2 at large x

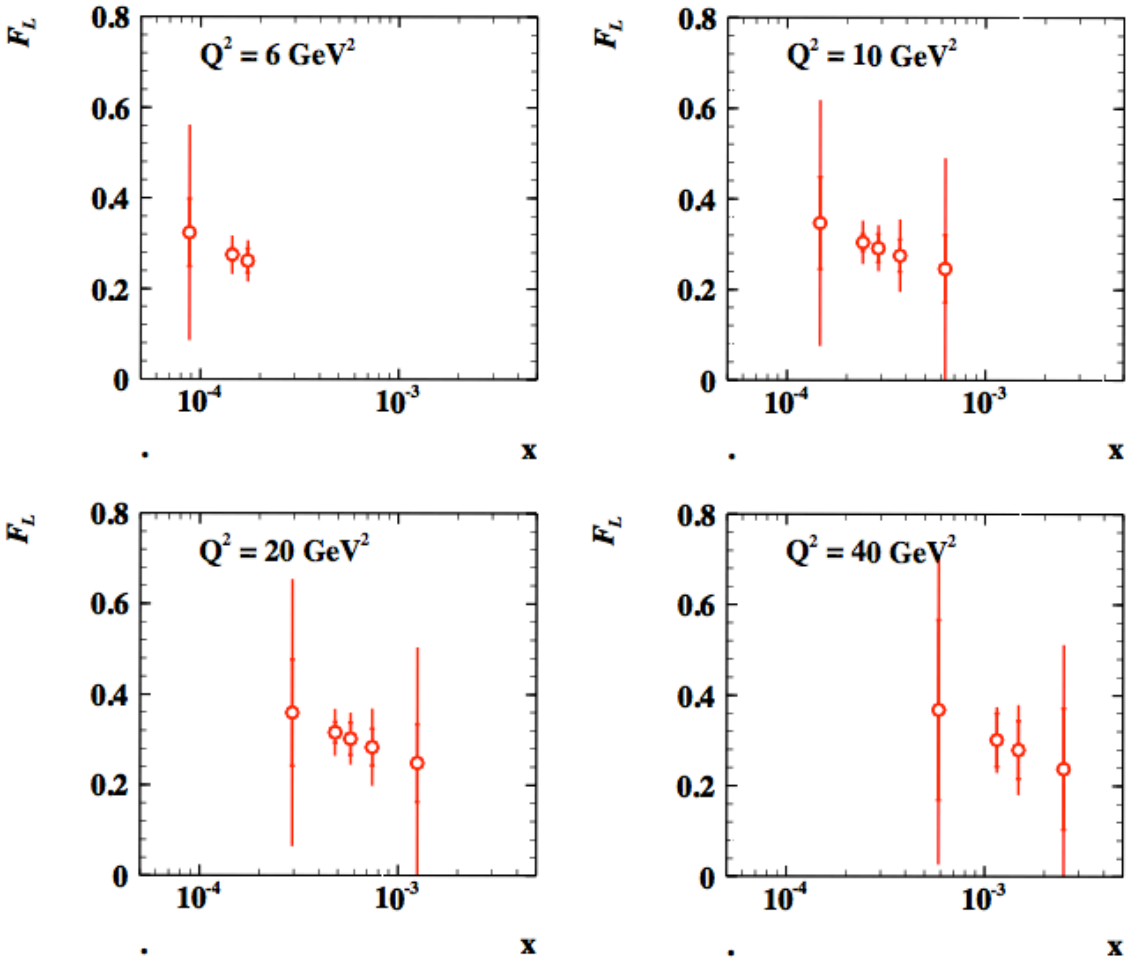

10
1
0.1
10
100
1000
Q^2/GeV^2
x=0.07
simulation 460 GeV*27.5 GeV 30 pb-1
x=0.10
x=0.14
W2=20GeV
x=0.18
x=0.23
x=0.25
x=0.35
x=0.45
BCDMS data
x=0.55
x=0.65
y=0.3
at 280 GeV

An intermediate energy



920 GeV 30 pb^{-1}
575 GeV 7 pb^{-1}
460 GeV 10 pb^{-1}

1 TeV



1000 GeV 5 pb^{-1}
920 GeV 30 pb^{-1}
460 GeV 10 pb^{-1}