HERA Status

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MPY - DESY

HERA, 63rd PRC May 2007

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Luminosity Production





Luminosity Production





Overview Operated Currents



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Luminosity



 L_s lower than with electron operation. Dynamical effect corrected by empirical tuning with dispersion bumps. High proton currents. Stable operation with \sim 40mA of positron current.



Polarization



Operation at mirror tunes!

Data from PolArch - Thanx to M. Vogt!

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Statistics





Improvements - Fast e+ orbit feedback

Reduce proton emittance growth and backgrounds

- Vertical and horizontal air coil correctors installed.
- Fast BPM readout working.
- Drivers for air coil correctors tested.



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Improvements - Fast e+ orbit feedback



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Improvements - Fast e+ orbit feedback



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1 Short Summary e+/p High Energy Running



3 Conclusions

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Reminder Luminosity

Luminosity

$$\mathcal{L} \propto rac{I_{p} \cdot I_{e}}{\sigma_{x} \cdot \sigma_{y}}$$

Beam Size

- Adiabatic Damping: Proton beam emittance $\sim 1/\gamma$
- Aperture Requirements: $\beta_{IP} \sim 1/\gamma$

Beam Intensities

 Essentially fixed by technical constraints.

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$$I_p \cdot I_e \approx const.$$

Luminosity scales as γ^2

Proton Luminosity Optics



Low energy proton optics. $\beta_x = 4.9$ m and $\beta_y = 0.36$ m at the IP.

Maximum beta function: $\beta_x = 1006$ m and $\beta_y = 945$ m.

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Positron Luminosity Optics



 $\beta_x = 1.26$ m and $\beta_y = 0.52$ m at IP.

- No shift of the rf-frequency needed in order to match the beam size of the protons.
- 60° phase advance in the arcs ⇒ reduced chromaticity!
- 3-family per plane sextupole correction scheme implemented. Recableing in the tunnel needed!

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Orbit in the IR in Lumi File



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Preparations

- Conceptual design completed mid 2006.
- Optics design completed in Fall 2006.
- Regular meetings between machine and experiments for preparation of Low Energy Running.
- Two perids of 3 days dedicated machine studies (December 2006 and February 2007).
- One week of setup time at startup.

Summary Startup



Smooth startup phase due to solid preparation.

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The first two weeks



Steady luminosity production alredy in the first two weeks!

- 52 MHz proton-rf transmitter system A broken ⇒ solved.
- Large fraction of coasting beam ⇒ solved.
- Poor proton lifetime \Rightarrow solved.

Experiments could still take data!

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Specific Luminosity





- High specific luminosity reached from the very beginning.
- Mind: 1/4 of specific luminosity at 920GeV expected!
- Stable operation. Fewer unscheduled beam losses.
- Short duty cycle.

Data from PolArch - Thanx to M. Vogt!



Operated Currents

- High proton currents reached.
- Positron currents limited due to vacuum situation in the IR south.
- Seal changed on maintenance day ⇒ improvment of situation expected.



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Data from PolArch - Thanx to M. Vogt!

Polarization



Data from PolArch - Thanx to M. Vogt!

- Fast build-up of polarization.
- Average polarization of 50% reached!
- Pol. benefits from smaller beam-beam tuneshift!
- No aggressive tuning of the positron tunes necessary.
- High polarization AND high specific luminosity established.

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Collected Integrated Luminosity (at H1)





Short Summary e+/p High Energy Running

2 Low Energy Running



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Conclusions

High Energy Running

- e+/p Operation at 920GeV successful! 180 pb⁻¹ delivered.
- High proton intensities: Ip > 117mA!
- Positron intensities not pushed above 43mA ⇒ stable operation.
- Low Energy Running
 - Very short setup time!
 - Stable luminosity production at high level achieved!
 - High polarization achieved!
 - Ahead of schedule!

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