

HERA Status and Plans

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- **HERA Present Status**

- Machine Model
- Beam Intensities,
- Luminosity,
- Vacuum,
- operational Procedures

- **Open Problems**

- Topics for further Study
- necessary beam times

Beam Optics

- Machine optics debugged: lattice functions are now within 10%-15% deviation from the design values,
 - Some of the fixes are empirical corrections without full understanding of the reasons, other fixes are well understood
- ➔ **Conclusion:** Machine Model and Beam Optics now in good agreement, residuals are considered sufficiently small for routine luminosity operation, but may be not for polarization

Beam Intensities

- **Leptons**

e⁺ intensities of 41mA achieved limited presumably by vacuum correlated effects (cavity vacuum, IR effects, etc)

Do not expect major obstacles to go to Y2000 intensity

Protons

Sofar limited to ~60mA in 180 bunches

Expect technical problems in 208MHz and 52MHz systems when attempting to go to full intensity, but nothing should prevent us to reach y2000 peak currents in principle,

new diagnostics systems suggests the existence of coupled bunch → instabilities which needs to be adressed to achieve the necessary small bunch length to avoid hour glass effect and get full luminosity

Vacuum

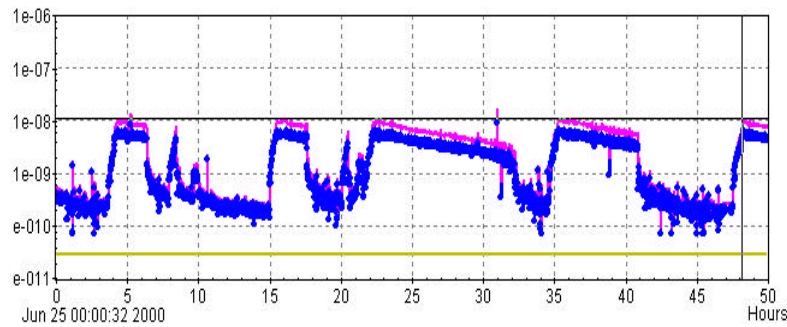
- IR vacuum has improved despite of many unwanted venting events
- Base & Dynamic pressure is only slightly larger than in 2000 (factor ~2), dose 4Ah, need 30Ah in the arcs for conditioning
- some room for improvement
- Concerns Presence of methane in dynamically increased beam vacuum
- (needs confirmation)

Comparison of dynamic pressure increase July 2000-September 2002

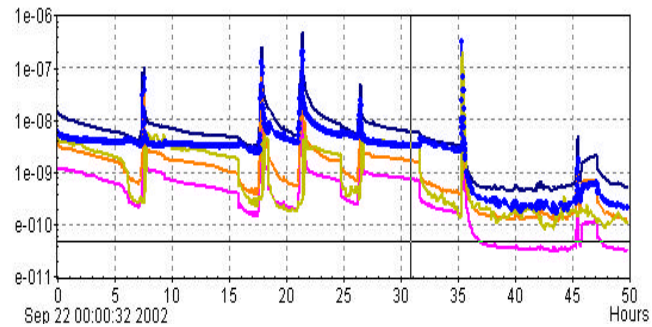
12GeV effects not present (not relevant for chamber currents)

Base pressure and dynamic pressure rise comparable with 40% of e intensity in 2002 w.r.t. 2000

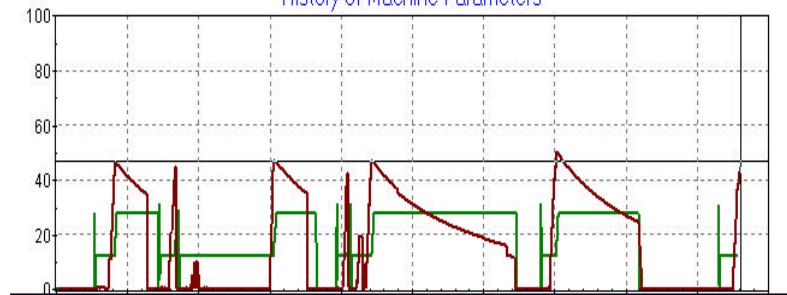
e-Vacuum IR NR July 2000



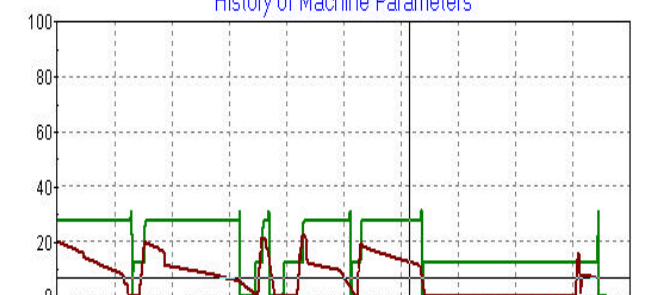
e-Vacuum IR NR Sept 2002



History of Machine Parameters



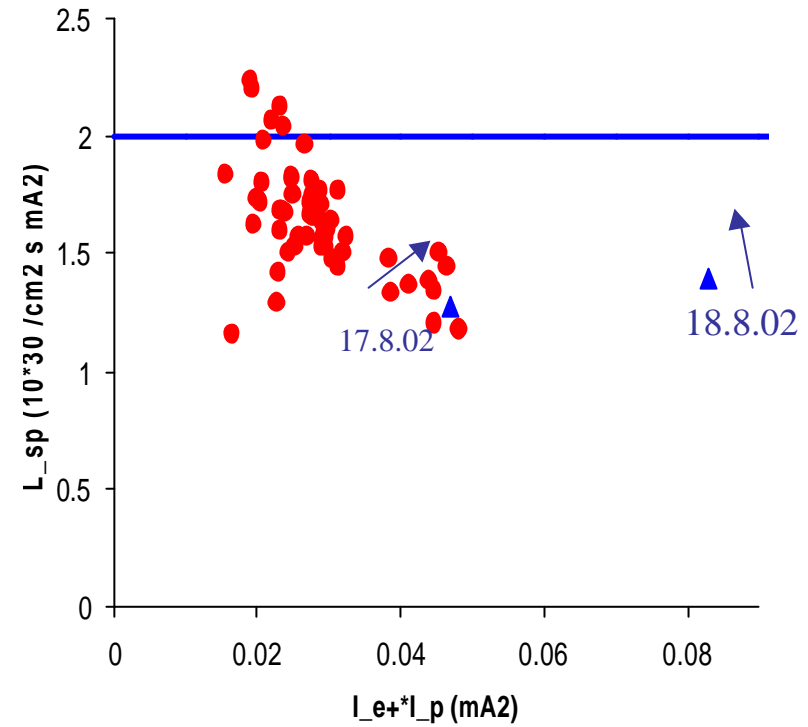
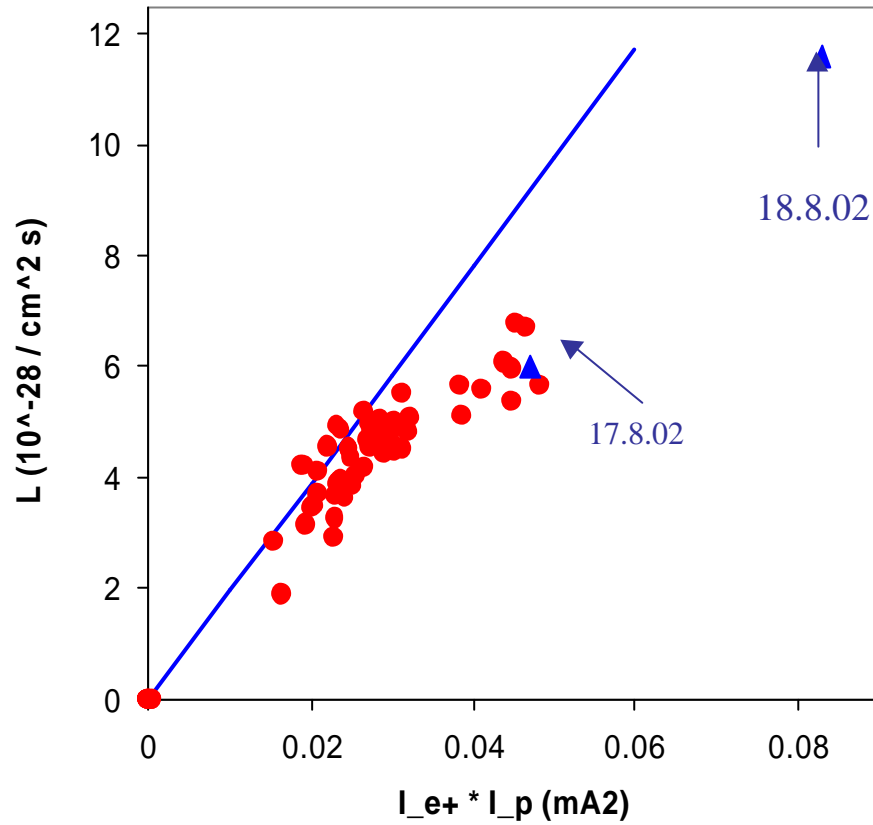
History of Machine Parameters



Luminosity

- Specific luminosity reaches values close to expected values for low bunch intensity
- At medium bunch intensity (50%) of p-design, specific luminosity low by 30%
- Luminosity at design bunch population not yet tested
- Luminosity tuning just started
- ➔ Need more systematic study
- Highest absolute luminosity as measured by H1
 $\sim L = 8.9 \cdot 10^{30} \text{cm}^{-2} \text{sec}^{-1}$

Luminosity versus p- Bunch intensity



Courtesy M.Minty

Operational Procedures

- Operational procedures are developed well
- Orbit feedback seems to provide the necessary good conditions during the ramp and ZEUS calorimeter tuning
- Synchrotron radiation background tuning is supported well and is performed routinely
- ➔ Operations is continuously developed further for more effective operating and more transparency in pursuing issues and trouble shooting

Technical Aspects of Accelerator Operation

Large effort in M has made a significant impact in improving over all reliability and availability of the accelerator complex

→ Need continuously to work on further improvements, maintenance & replacements

Topics which need further studies

- **Luminosity issues** 3 weeks dedicated studies + as much luminosity running as possible
 - **p-intensity** issues 1 week dedicated studies+ continuous pushing for highest proton intensities
 - **e-Intensity**: continuous pushing for high e intensities, occasional dedicated studies for feedback (re-)optimization
 - **Beam optics**: further fine tuning as preparation for polarization studies (a few days of MD)
 - **Beam Dynamics**: need to understand why it is not possible to reach polarization tunes (no time estimate, 6 shifts for systematic measurements)
 - **Polarization**: 4 weeks of initial study: 1 week to repeat the y2000 result, 1 week to turn on rotators with beam 1 week to optimize polarization with 3 rotators, 1 week to learn what are the problems with solenoids on
 - **Vacuum**: brainstorming and estimates for further improvements of the I R vacuum, improving conductance and pumping speed, adding integrated I P's in the
 - I R quadrupoles, warming up the GG beam pipe, clarifying the Methane question
 - **Operations**: further improvements in automatic steering and tuning
- 10 weeks of accelerator studies, not too strongly segmented