

HERA Status

HERA-Experiments Coordination Meeting, May 8, 2002

F. Willeke, DESY-MHE

e-Ring

p-Ring

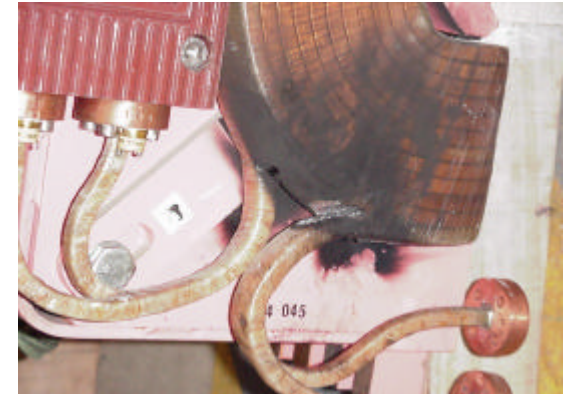
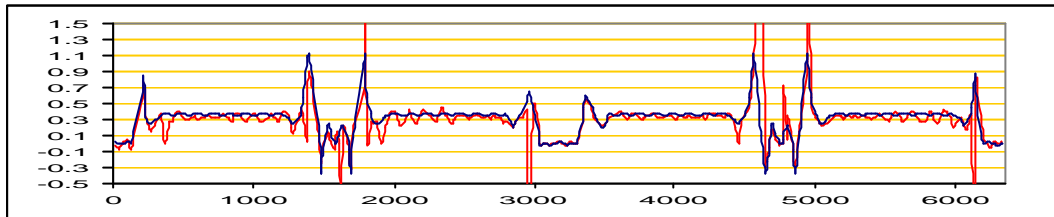
Luminosity Operations

Backgrounds

Proposed Schedule

Status of the e-Ring

- Beam Optics seems to be ok after fixing a quadrupole with a winding short

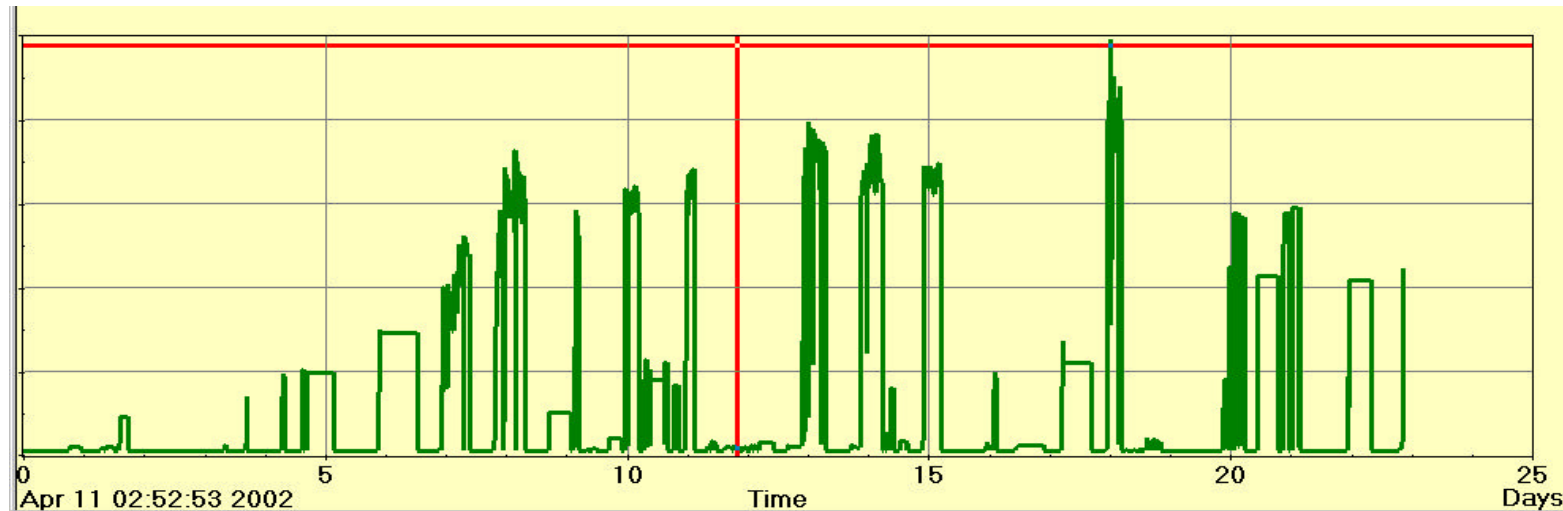


- Dynamic Aperture at 12GeV more than sufficient at 12GeV
- Injection efficiency ok for luminosity operation (though still not 100% as should be expected)
- Synchro-Betatron Resonances stronger than before (need to be avoided to avoid beam loss, ok)
- Luminosity optics tested at 12GeV without solenoid ok
- Polarization tunes under luminosity conditions still a problem
- → under investigation

e-Ring High Intensity Commissioning

- Largest beam current so far : 31mA @12GeV
 22mA @27.5GeV
 limited by vacuum conditions NR at present
- RF and Feedback systems: No challenging beam currents yet

e-Beam Currents in April, full scale is 33mA



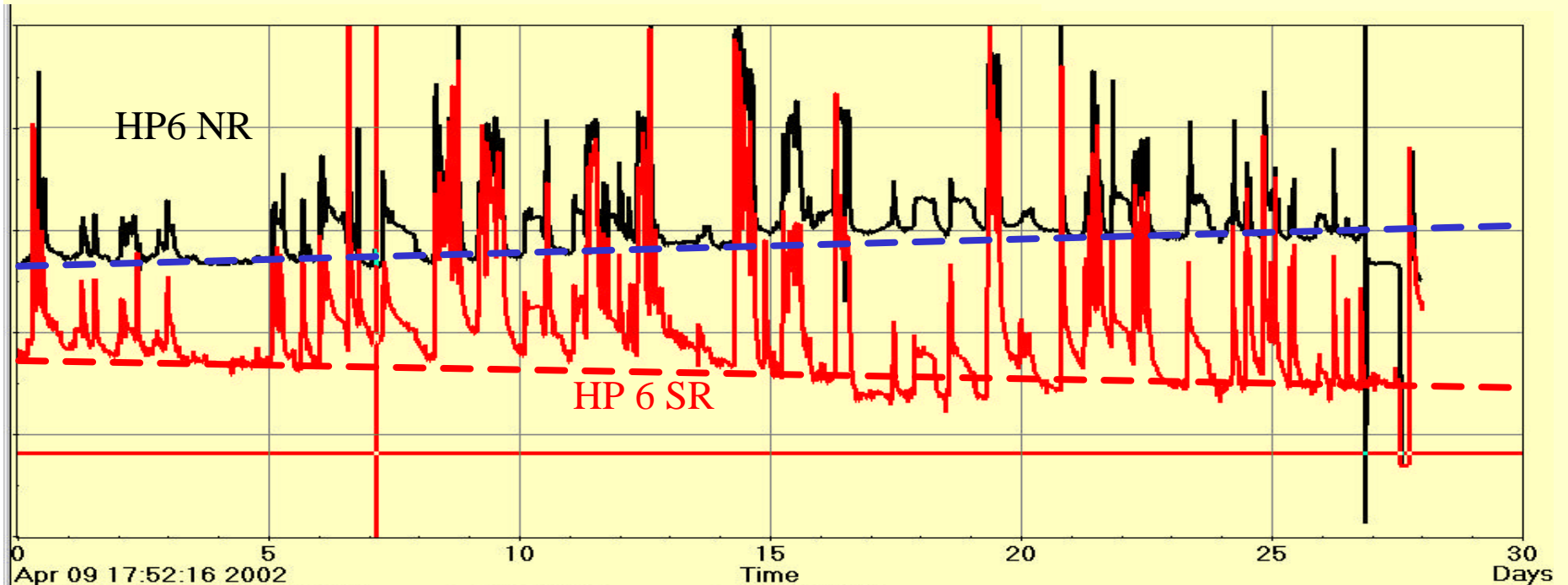
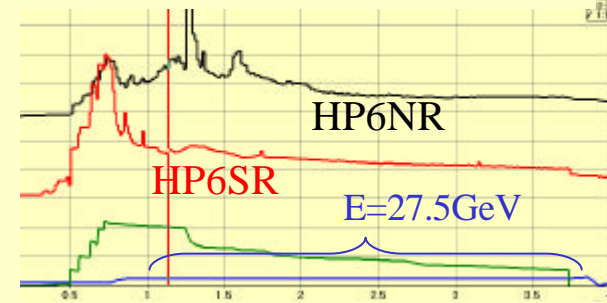
e-Vacuum Conditioning

Sensitive Spot SR/ NR 6 m (lumi tagger position) Pressure increase with beam current at 12GeV (HOML)

SR: slow improvement of base pressure from $1.2 \cdot 10^{-9}$ mbar to $6 \cdot 10^{-10}$ mbar

NR: base pressure getting worse $1.6 \cdot 10^{-8}$ mbar to $3.2 \cdot 10^{-8}$ mbar

Sunday May 4, 13:00h



Getter Pumps NR6 & SR6 4 weeks in April

Summary e-Ring

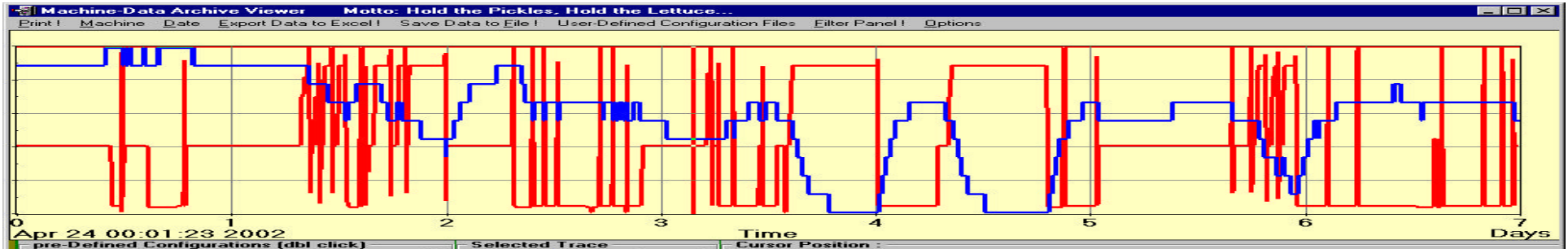
- Machine conditions good enough for initial Luminosity operation with up to 20mA
- Vacuum problem cumbersome
- Beam lifetime at 27.5GeV still requires attention

Proton Ring Status

- Beam Optics at 40 GeV and 920 GeV seems ok after a bug in saturation and remanence treatment of GB quadrupoles was discovered and fixed (ok still need to be confirmed by optics check)
- There is some non-understood breakdown of lifetime at 64 GeV → still to be studied
- Beam Lifetime and Injection Efficiency ok (90 mA should be possible)
- No high intensity test of RF systems (weak spot)
- Beam tends to be more unstable at 40 GeV than before (long.)
- Highest Beam Current so far at 920 GeV: 45 mA

Summary: Satisfactory for Luminosity operations

Operations



Horizontal Movement of the magnet bridge NL 7m horizontally over 7days (blue, magnet energy in red), scale is 0.2mm

Magnets on bridges and in detector move under magnetic forces and due to thermal stresses:

Handling of these during ramp no problem (after some fixing of ZEUS GO)

→ all this can be handled well by operational procedures

Beam Orbit control and orbit reproduction will be essential for efficient luminosity operation

→ Improvement of BPM system and software development for automatic orbit control well underway

Luminosity

- We did not observe limitations due to beam beam effect yet (though intensity is still low, protons ~60% of design, Positrons ~65% of the design)

- Measured Specific Luminosities

$$L_{\text{spec}} = (0.9-1.4) \times 10^{30} \text{cm}^{-2} \text{sec}^{-1} \text{mA}^{-2},$$

smaller than expected from measurement of beam optics and emittances (expect at least 1.4)

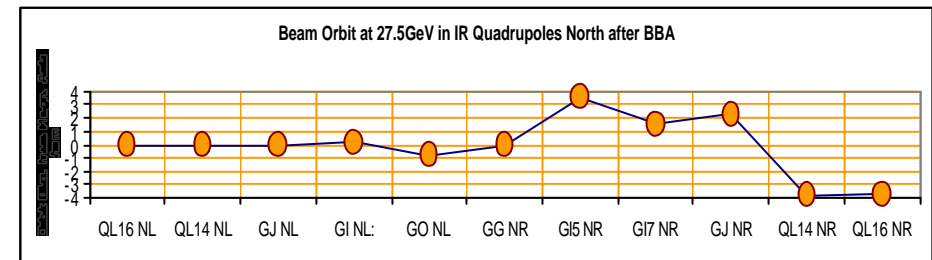
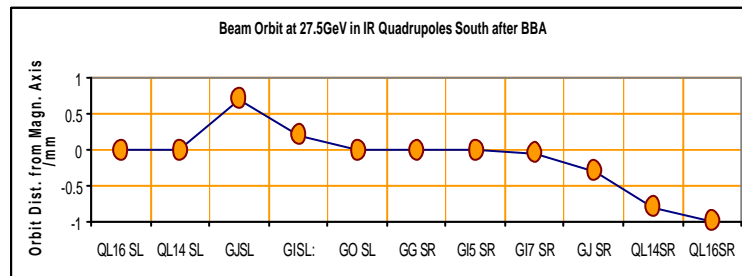
No luminosity scans 2002 yet

- Luminosity procedure still difficult (background control) and not (yet) well enough supported by software

TOO DIFFICULT FOR BKR TECHNICAL SHIFT CREW

Backgrounds

- Synchrotron Radiation backgrounds significantly reduced by the new absorbers and collimators
- Existence prove in case of H1:
- For low e^+ currents only, H1 background conditions like in y2000 achieved (ZEUS: factor of 5 missing)
- Beam based alignment converges and starts to be useful in background optimization procedure



Technical Readiness of HERA

- Progress very much slowed down by numerous technical failures:
Since 11.4., more than 120 severe failures which caused loss of beam and delayed injection for at least an hour each
- **ALL HARDWARE SYSTEMS**
→ DESY has not relearned yet how to keep a machine like HERA running

New Pressure Regulators

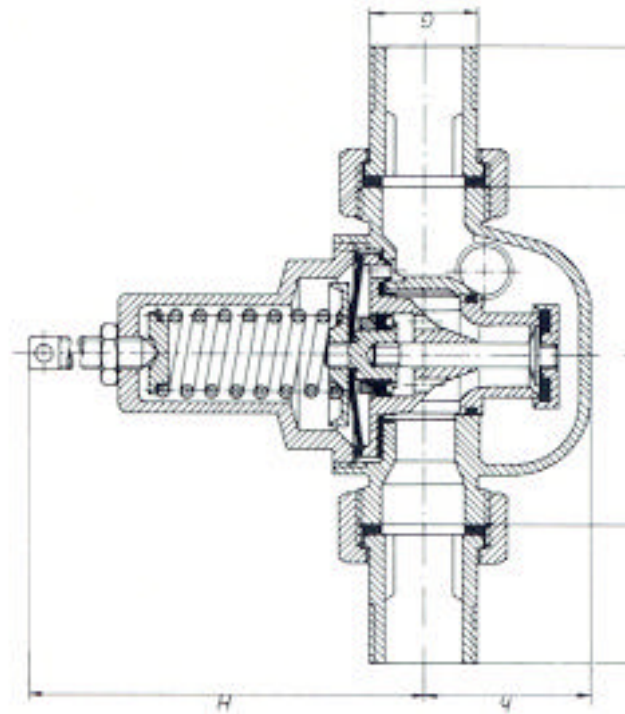
(used in RF Cavity cooling systems)

Springs:

Probably have to

Replace alle the
springs?

→ Under investigation

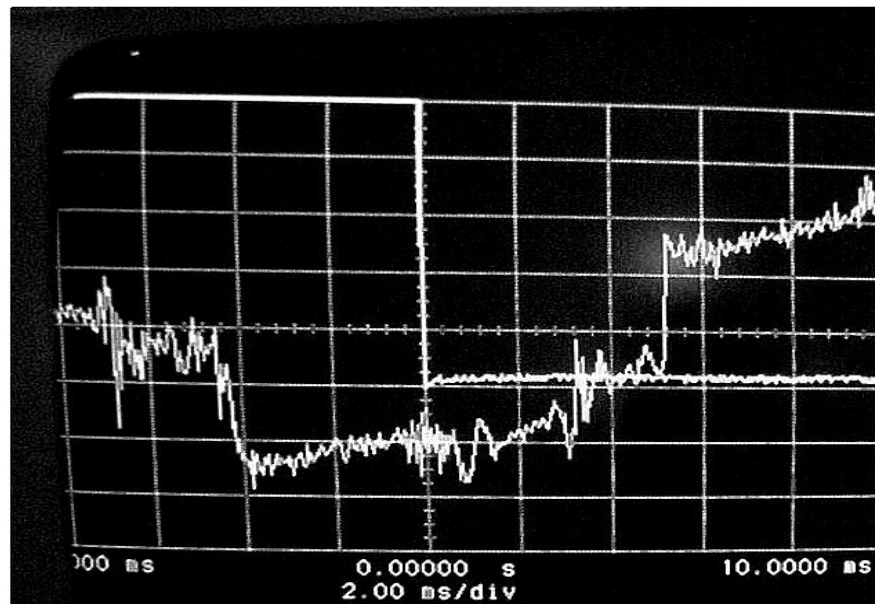


Manpower

Help from experiments is highly appreciated and the taskforces supported by accelerator physicists help to solve problems more quickly:

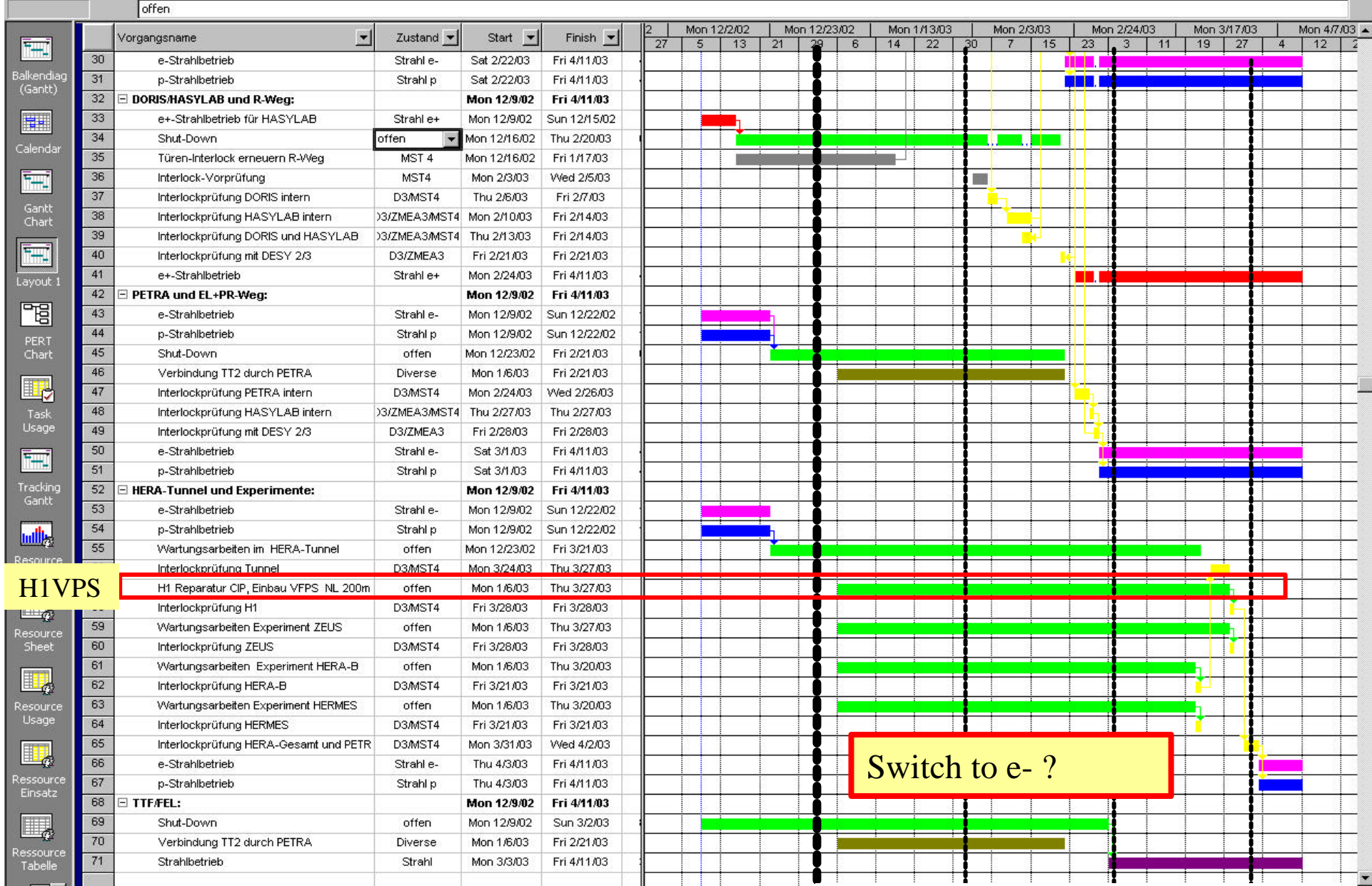
However there are not enough experienced machinephysicists and engineers working in the control room to make it all work!

Frequent Trips of cold VG/VO in H1 and ZEUS:
Does detector field regulation talk to quench protection via
Magnetic Coupling?



Proposed Procedure

- **Run without interruption through summer and fall to get decent luminosity and background conditions with e+, thus give up the switching to e- in June**
- **Switch to electron in January in each case (if can't make e+ work until then, we should try to do a better job with e)**
- **Install the H1 VFPS in January-February**
- Introduce a maintenance day at June 4
- Extend September maintenance day to 3day
27-29 of August to do service on 110keV switches (HEW)
- Shift work on PETRA heat exchanger (no protons) to winter shut down
- We need a steady increase of intensity to solve the backgrounds at high intensity



H1VPS

Switch to e- ?