Report of the Technical Coordinator

Daniel Pitzl, DESY

H1 collaboration meeting, Marseille, 17.9.2003

- Cosmics run
- Vacuum conditioning
- Polarized lumi run preparations

Cosmics run 4.–23.7.

Program:

1. Close H1: Fri 4.7.03
2. Field-on cosmics for FMD, Spacal, BPC: 4.–9.7.
3. Flammable tracker gases ready: 10.7.
4. Field-off cosmics for FTD alignment: 10.–14.7.
   In parallel: CIP commissioning.
5. Field-on cosmics for CJC, FTD, FMD calibration, LAR HV curve, Digital Muon studies, FTT tests: 14.–23.7.

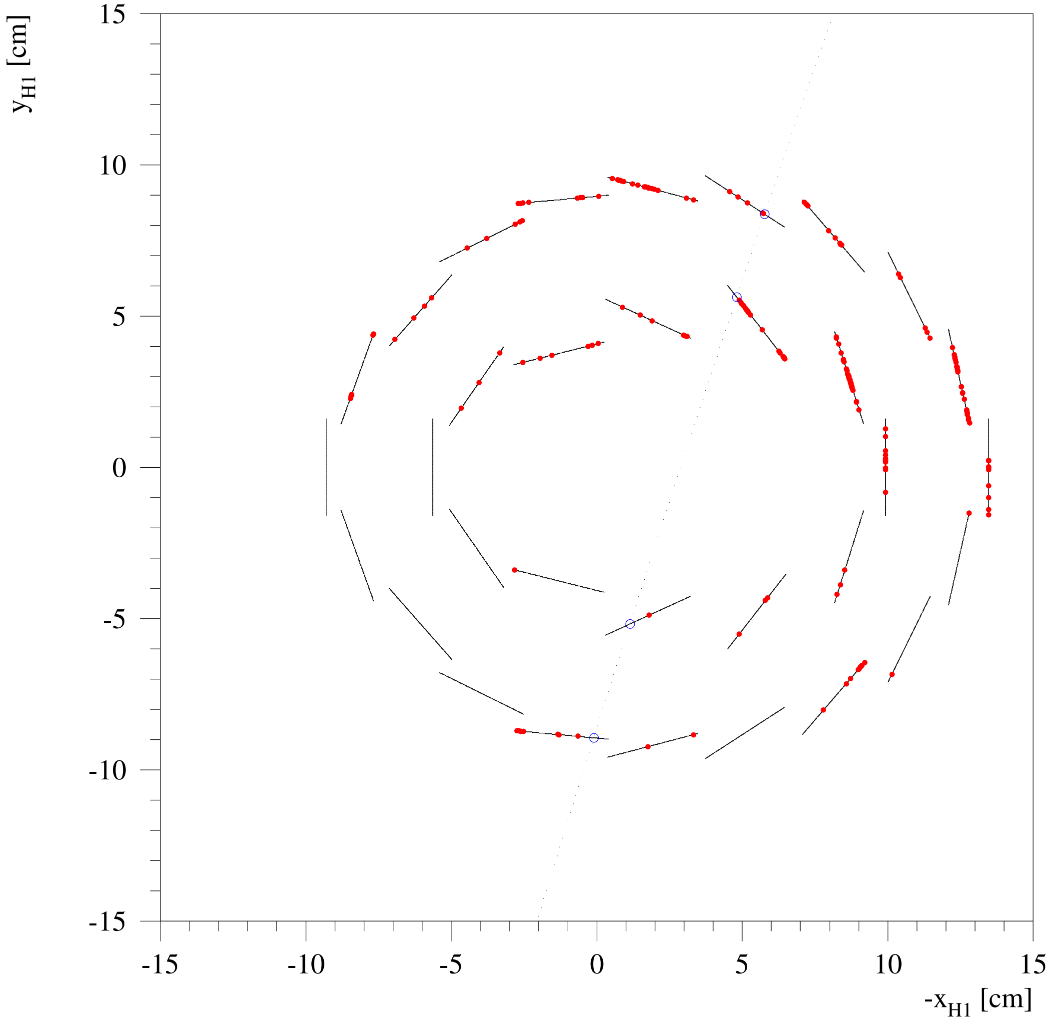
Results:

- BPC
- Digital muons
- CST

Tomorrow:

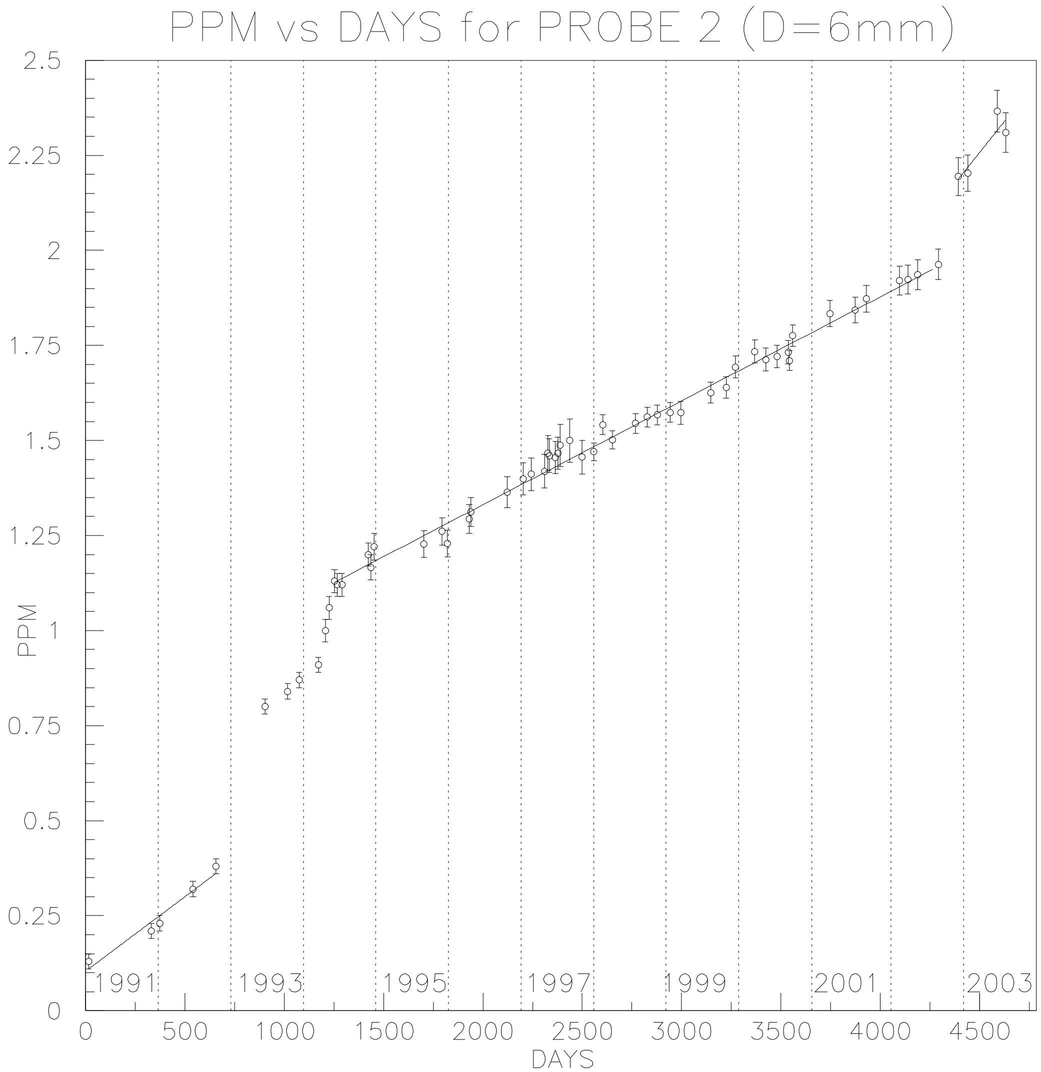
- CIP
- FTT
- CJC
- FTD

CST



- 1 quadrant is dead (+z, lower half): short in power cable for receiver of optical control signals. Not at CDA.
- Very low hit efficiency in cosmics run due to time critical control signal. Now adjusted.
- CST needs another cosmics run for alignment data.
- Repair needs a ∼6 week shutdown (Spacals, BPC, GG, BST, CST).

LAr purity

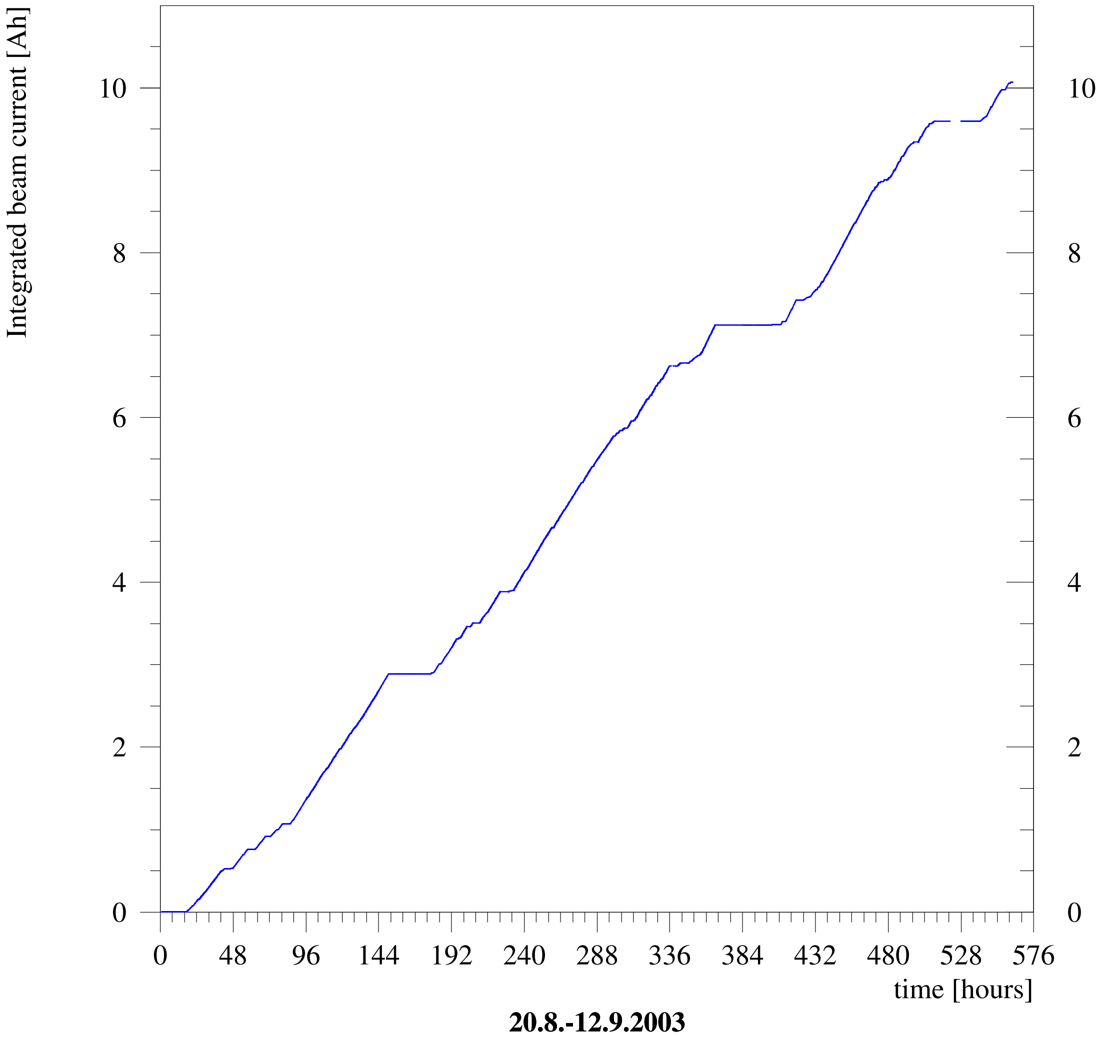


- LAr purity monitored with Bi^{207} source since 1991.
- Step in 1993: pump LAr to outside vessel in shutdown. Not done anymore.
- Increase in 1994: small leak, O_2 contamination.
- Slope 1994–2002: 0.1 ppm/yr
- Charge collection efficieny: -1%/0.24 ppm
- Step end 2002: change of readout board.
- Increased slope in 2003?
- HV was off $\Rightarrow$ less gettering.

Background reduction measures

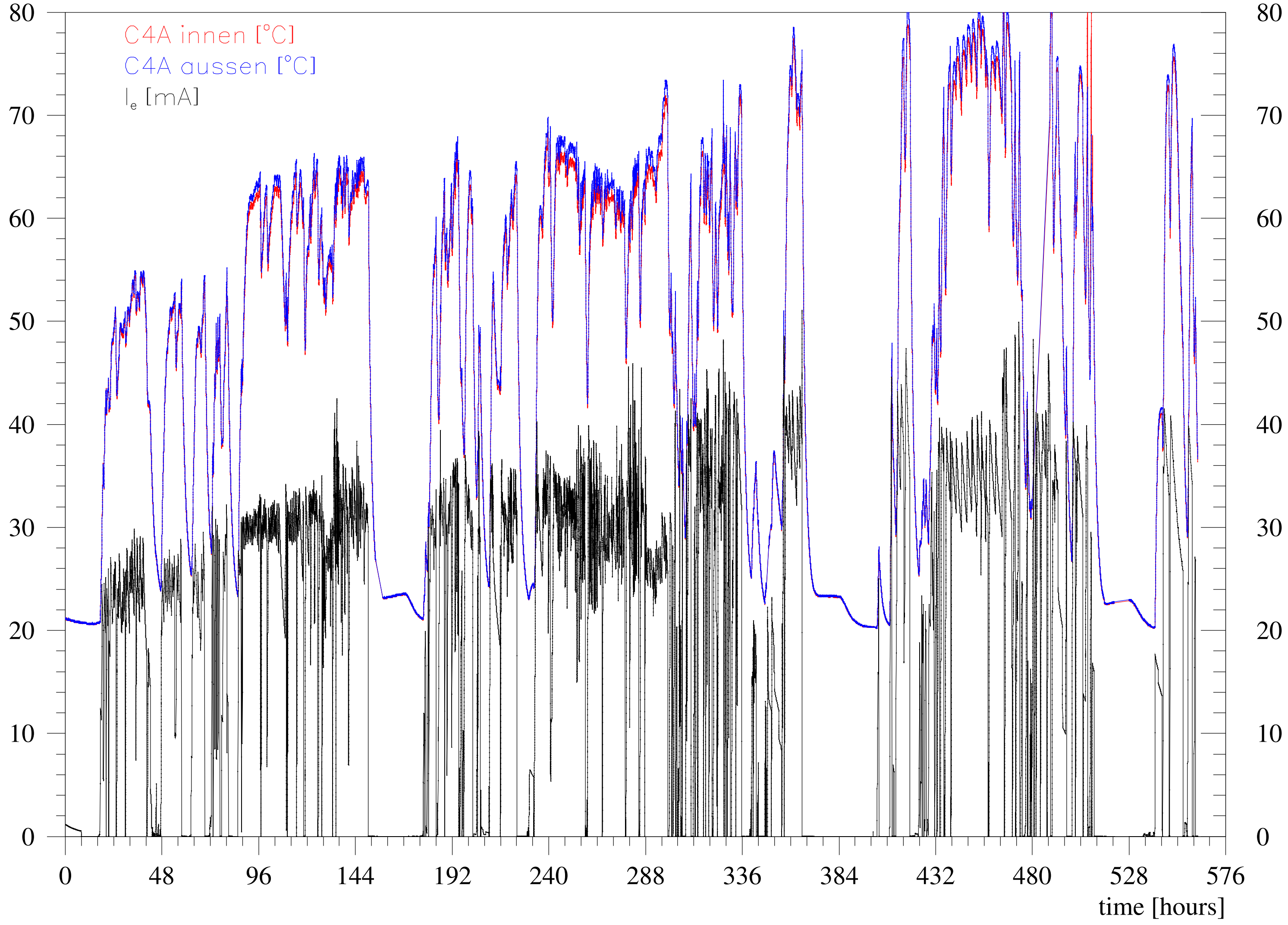
- New integrated ion getter pump in H1 solenoid field at $z = -1.45$ m. Works well.
- Pumping conductance at ABS 1 and 2 (-3.6 and -6.0 m) increased by cutting out every 2nd RF grid bar.
- Getter pumps at -3.6 and -6.0 m doubled, conductance increased by removing every 2nd RF grid bar.
- Rest gas analyzers at -3.6 and -6.0 m installed, for in-beam diagnostics. They work well with beam, but need better magnetic shielding.
- NEG pump installed at $z = 28$–33 m to reduce e-gas background (Spacal hot spot).
- Lead shielding around backward beam pipe ($z = -0.8$– -1.4 m) against backscattered synchrotron radiation.
- Coating of the main SynRad absorber with thin layers of Cu and Mo failed due to soldering problems.

12 GeV bakeout



- Vacuum conditioning by higher order mode beam pipe heating at 12 GeV.
- Accumulated 10 Ah in 3 weeks, as planned.
- Weekly warm-up of GO, GG cold beam pipes (55 K to 285 K) and NEG pump regeneration.

H1 beam pipe temperature during 12 GeV bakeout



20.8.-12.9.2003

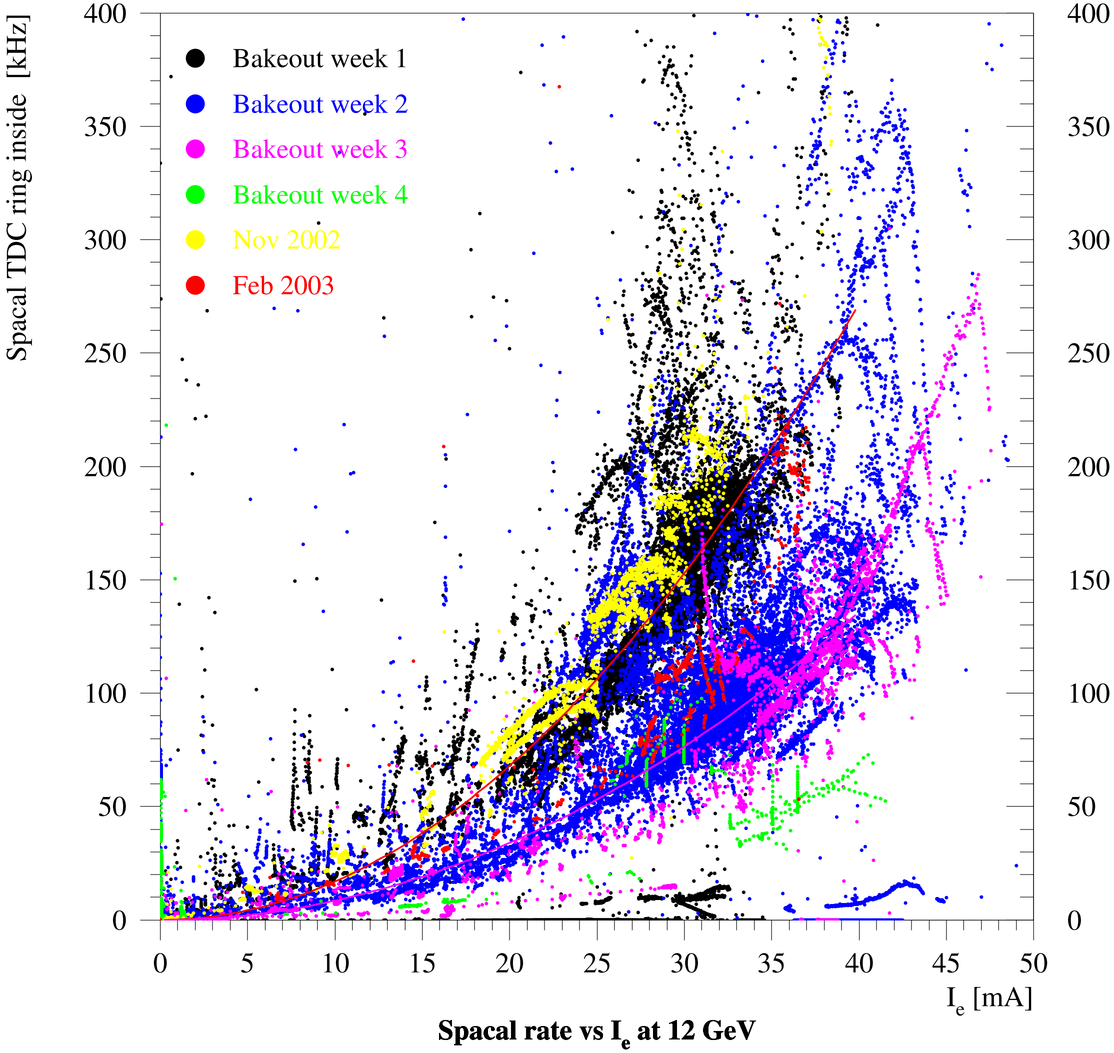
Highest T around C4A collimator at $z = 1.45\,\mathrm{m}$.

Automatic beam dump at 80^{o}C.

$\Rightarrow$ beam current limited to about 42 mA.

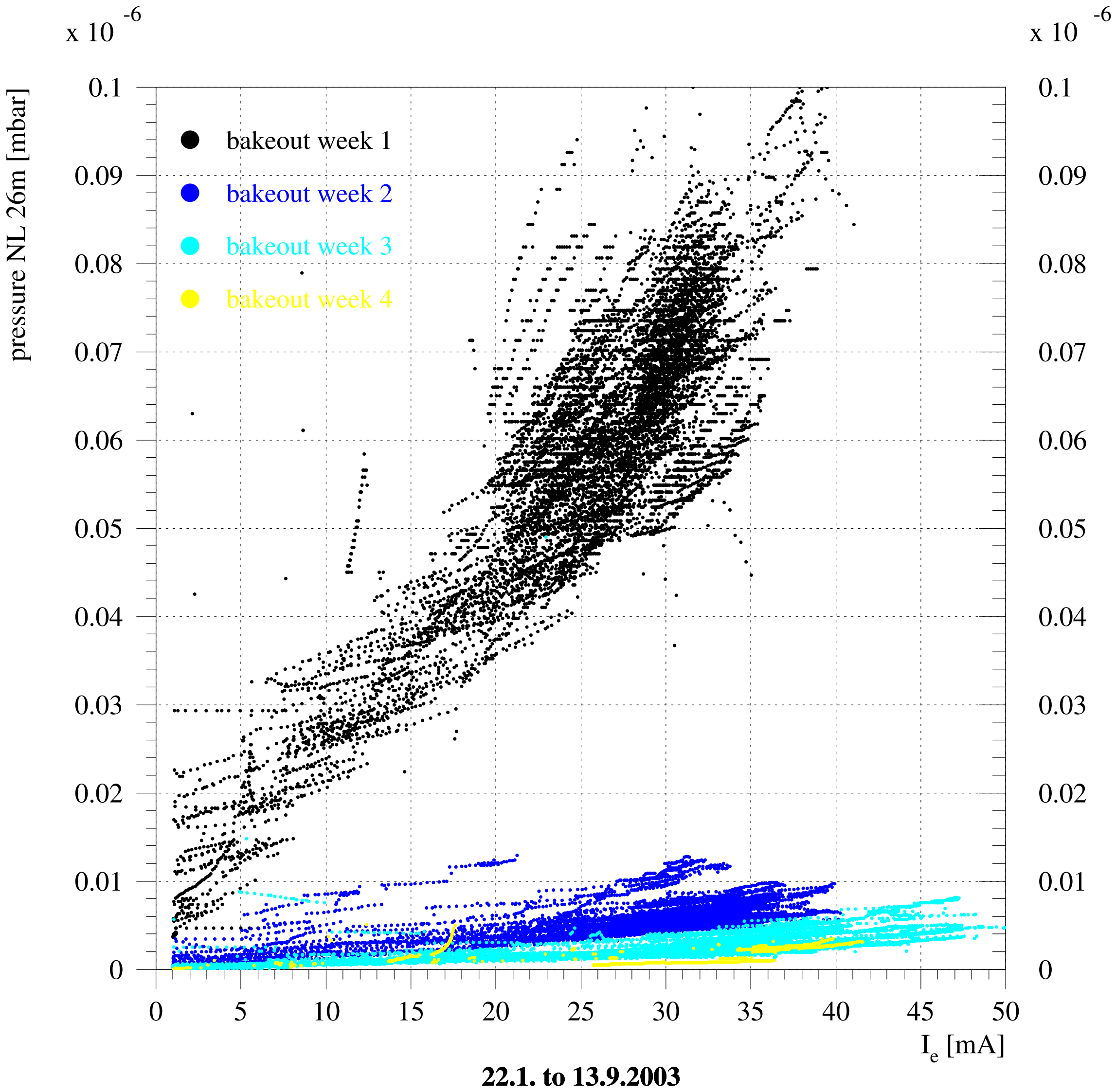
Short fills up to 52 mA possible.

Spacal e-gas rate at 12 GeV



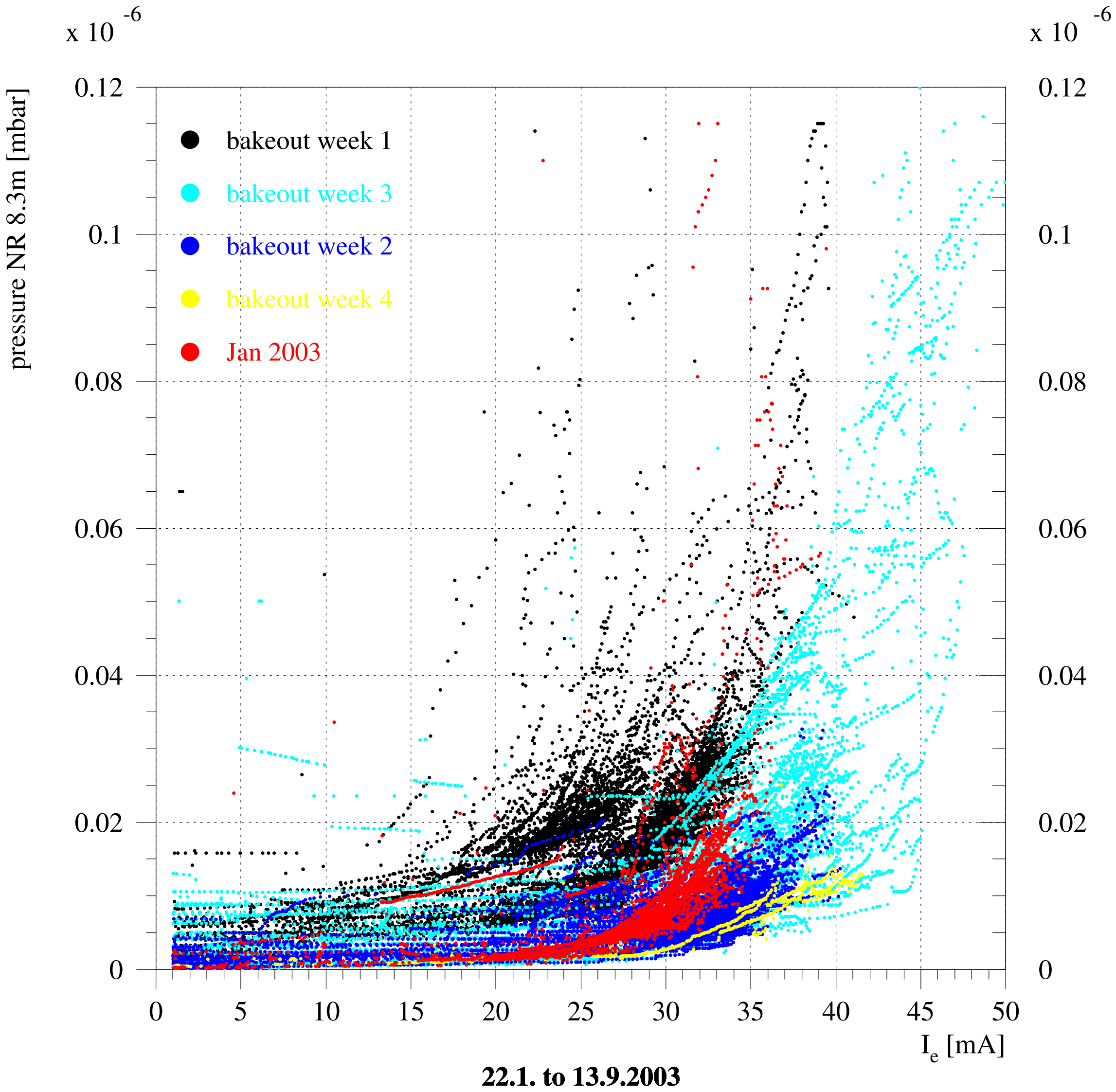
- Spacal TDC rates are sensitive to e-gas background from up to 60 m.
- Rate depends on $I_e < p >$.
- Quadratic dependence on I_e indicates only linear pressure increase. Consistent with pump readings.
- Significant improvement during the bakeout.
- Rates are lower than ever before at 12 GeV!

Pressure at $z = 26$ m during 12 GeV bakeout



- Beam pipe was vented in this region during the shutdown for NEG pump installation in the GA magnet.
- GA NEG pump first activated after bakeout week 1.
- Only linear increase with I_e: little higher order mode heating, some synchrotron radiation even at 12 GeV.
- SynRad at 12 and 27.5 GeV:
  - $N_\gamma \sim E_e$: $\times$ 2.3.
  - $E_\gamma \sim E_e^3$: $\times$ 12.

Pressure at $z = -8.3$ m during 12 GeV bakeout

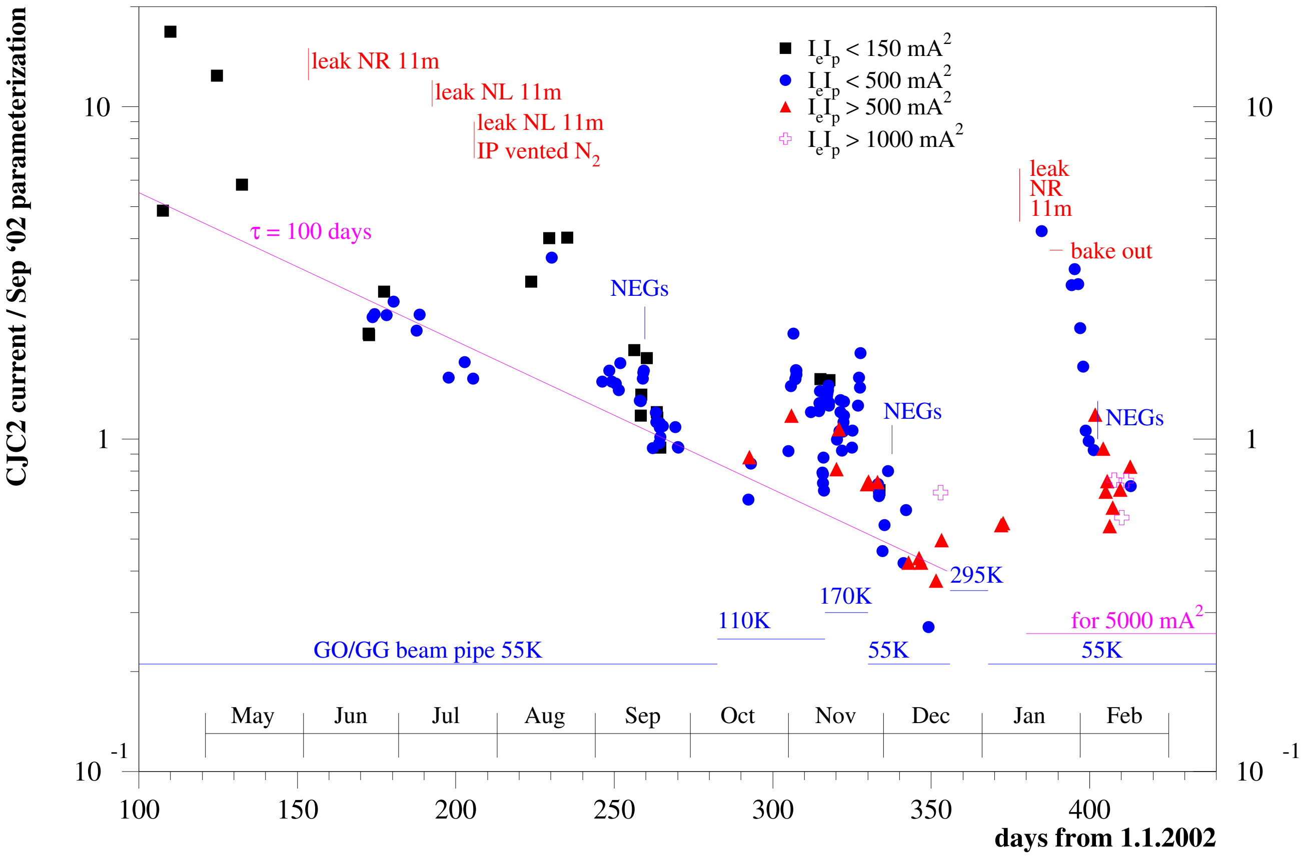


- Region -3 to -15 m is most relevant for proton-gas background.
- Pressure rises strongly above 25 mA at 12 GeV, as expected from beam pipe heating.
- Only small improvement during 3 weeks of bakeout.
- However, the level is similar to Jan 2003.

$\Rightarrow$ The conditioning from 2002 is not lost.

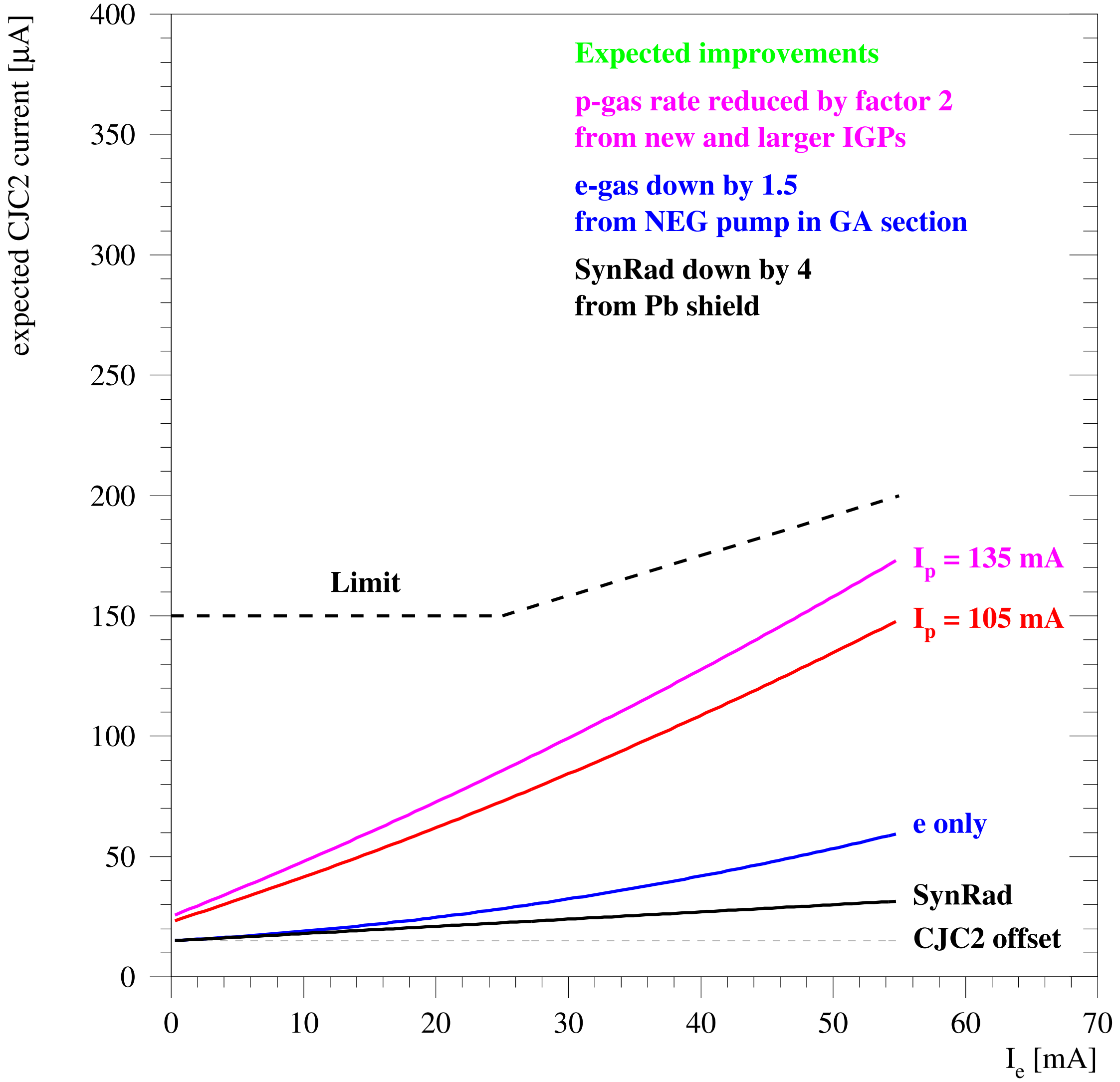
CJC current history until Feb 2003

CJC2: pedestal and SynRad subtracted,
normalized to Sep 2002 fit:



- Long-term improvement by factor ≈ 20 with $\tau \approx 100$ days Apr–Dec.
- Backgrounds in Dec and Feb were about a factor 2 higher than needed for safe operation at $47 \cdot 108\,\mathrm{mA}^2$.
- We expect to restart at these conditions, and improve from there.

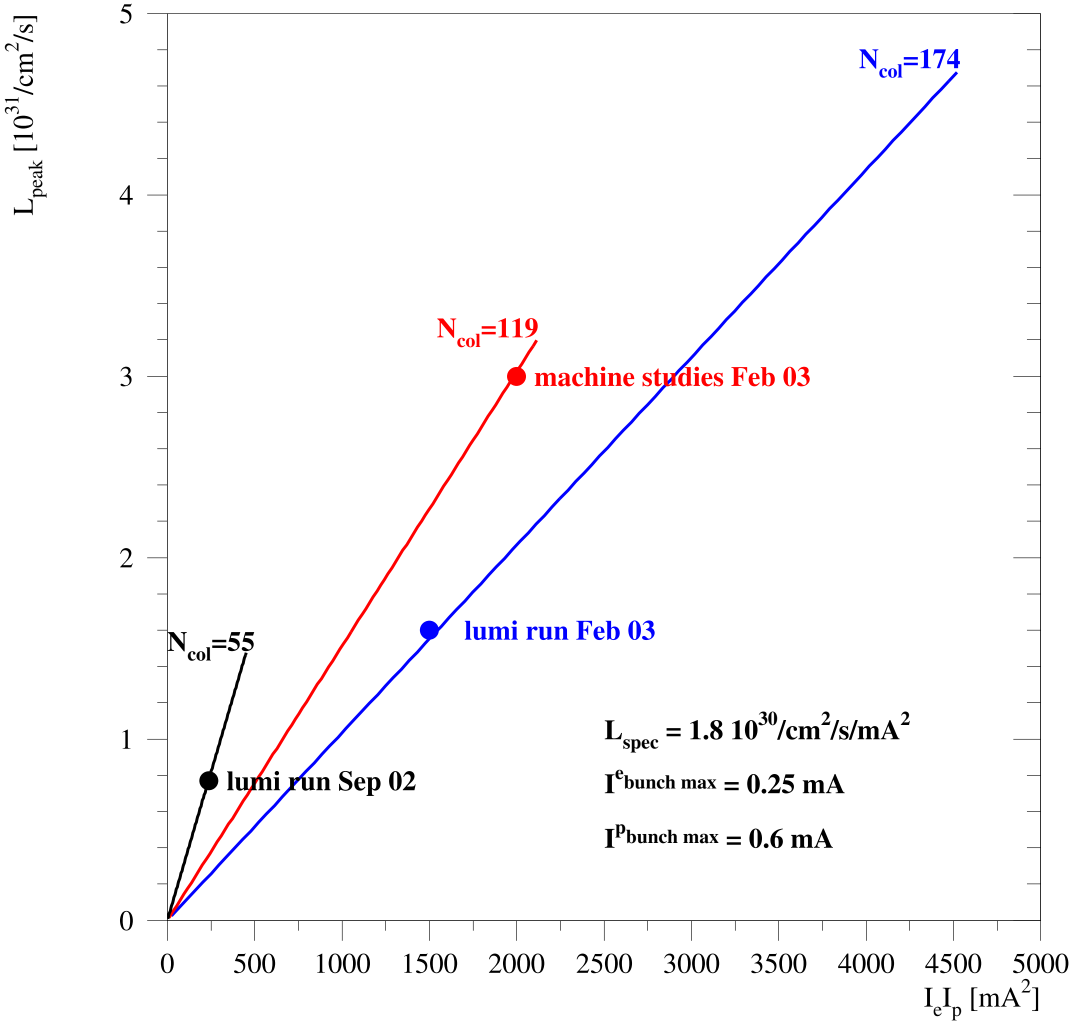
Expected chamber current



Assumptions compared to Dec 2002:

- Factor 2 lower pressure from new IGP, larger IGPs at NR3.6 and NR6.0, and long-term trend.
- Reduce e-gas rate by 1.5 with new NEG pump in GA section.
- Reduce SynRad by 4 with Pb shield.
- This should allow safe operation at $55 \cdot 105\,\mathrm{mA}^2$ if no (quadratic) surprises appear beyond I_e of 30 mA.

Optimizing luminosity



- $$\mathcal{L} = \mathcal{L}_{\rm spec}\,\frac{I_e \cdot I_p}{N_{col}}$$
- $\mathcal{L}_{\rm spec} = 1.8 \cdot 10^{30}$ /cm^2/s/mA^2.
- $I_e \cdot I_p$ limited by backgrounds.

$\Rightarrow$ Reduce N_{col}

- $I^e_{\rm bunch} \lesssim 0.25$ mA (beam-beam limit. Polarization?).
- $I^p_{\rm bunch} \lesssim 0.6$ mA (space charge limit at injection).

$\Rightarrow$ Start with 120 bunches.

H1 Detector Control and Monitoring

- New systems in PVSS:
  - CIP temperature monitoring and frontend loading.
  - Central Muons: HV, LV, gas flow, monitoring spectra.
  - Tunnel systems: FNC, FPS, VFPS, FTS HV control
  - VFPS Roman pot movement, rate and temperature monitoring.
  - LPOL cavity.
- General speed improvement (faster TCP/IP driver).
- Work in progress:
  - LAr HV control.
  - Central Slow Control: ARGUS ported to Linux.
  - Finite State Machine: global H1 on/off, trip recovery.
  - PVSS 3.0 announced for Dec 2003.

Preparations

- VFPS fiber detectors were taken out for the proton beam studies and will be installed Mon 29.9.03.
- The ETAG 40 crystal calorimeter was damaged in 2002, due to radiation and/or high temperature next to the e beam pipe. A vertical moving system has been installed, providing a safe injection position. New crystals are underway from Moscow.
- LPOL cavity:
  - Fast DAQ is operational.
  - Temperature stabilization at around 40^oC must be improved.
  - First laser-on-beam expected this month, but Compton beam line is shared with old Hermes LPOL.
  - First steps towards a new Compton calorimeter taken. Personpower needed!

HERA and H1 planing

• Establish collisions	done 14.9.03.
• Set up polarimeters	17./18.9.03.
• Start flammable tracker gases	17.9.03.
• Start H1 shifts	19.9.03.
• Tune for polarization and 27.5 GeV conditioning All 3 pairs of spin rotators are set for right-handed e^+. Switch helicity once before Christmas.	10 days.
• DESY Open Day and maintenance day	28./29.9.03.
• Start polarized luminosity operation	30.9.03.
• 11 week lumi run	until 17.12.03
• Machine studies and short Christmas break	until 4.1.04.
• Long, stable luminosity run in 2004	10 months.