Report of the Technical Coordinator

Daniel Pitzl, DESY

H1 collaboration meeting, 25.6.2003

- H1 shutdown
- Vacuum system
- H1 and HERA restart

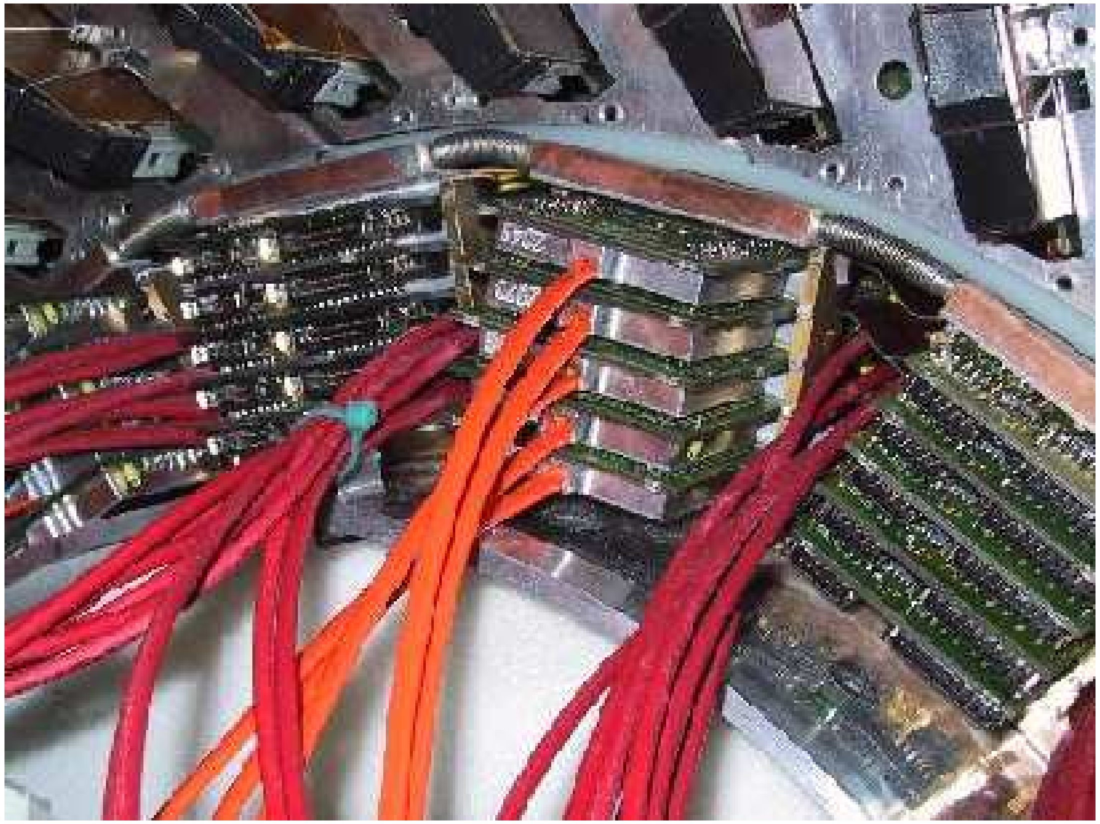
VFPS

At NR 220 m:

- Helium bypass built within 6 months at DeMaCo, NL. Cold tested at DESY.
- Inserted via Hall North ($\searrow$ HERA-B)
- Good collaboration with Kryo-, Vacuum-, Survey-, and Installation groups.
- 2 Roman pots with precision step motors from DESY. Steering code from Brussels.
- 4 fiber trackers from Zeuthen.
- Scintillators for trigger and rates.
- Readout electronics as in FPS from Uni HH.
- Commission with beam in September.

CIP

CIP frontend electronics:



- Heat damaged frontend cards exchanged (20 of 40). Optical links re-used.
- Second cooling water ring and heat shield to CJC preamps installed.
- Max T now 36^{o}C with all 5 layers powered.
- 40 individual control cables instead of 5 daisy-chains.
- One broken HV cable exchanged.
- 2 HV problems remain (broken wires?), in the same φ-bin. Masked out in trigger.
- Expect fully effective CIP-2000 trigger.

LPOL

Intersecting the e-beam at East Right 63 m:

Now enclosed in housing for thermal stability.

- Fabry-Perot cavity and laser system built and tested at Orsay.
- Installed at OR 63 m in April.
- Gain 9'000, stored power 4 kW, stability 1%, laser polarization controlled to below 1% (goal: few per mil).
- Photon beam line shared with Hermes LPOL, but using different calorimeters on moving platform.
- Pb-scintillator calo not radiation hard (few kGy/yr from Compton rate).
- New calo for $\sim 12\,\mathrm{GeV}$ γs needed, $\approx 4 \times 4\,\mathrm{cm}^2$, good linearity and stability.

Radiation damage

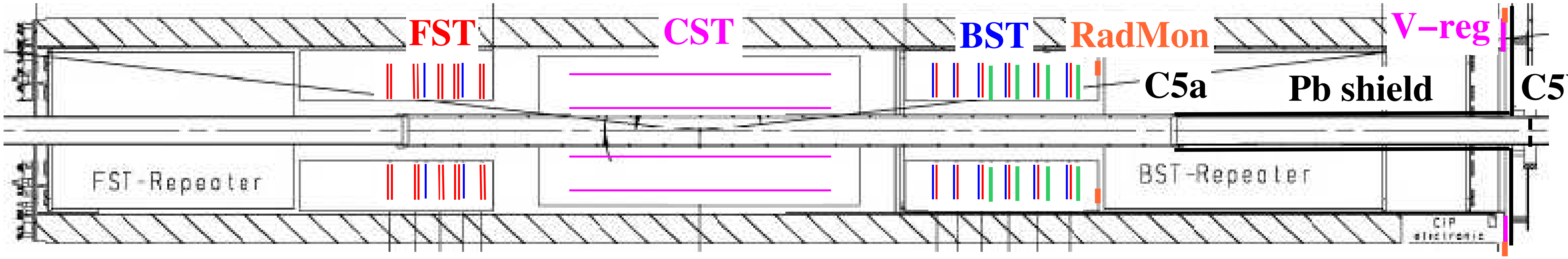
- BST repeater:
  - Most clock receiver chips were dead.
  - Several clock distributor chips were malfunctioning.
  - Most serial I/O chips for BST pad detector were dead.
- BST strips:
  - APC readout chips developed internal leakage currents that erase the signal charge.
  - 41 of 72 phi-strip modules were unusable.
- CST:
  - Voltage regulators severely damaged.
- Dosimeters confirm the pattern:
  - BST $z = -126$,cm: 10–30 kGy at $-z$ end. Damage
  - BST $z = -66$ cm: 5.5–7.5 kGy at $-z$ end. Damage
  - BST $z = -34$ cm: 0.08–0.11 kGy at IP end. OK
  - CST $z = \pm 25$ cm: 0.03–0.09 kGy. OK
  - FST $z = +34$ cm: 0.03–0.08 kGy. OK

Radiation protection

- Possible source: direct SynRad on C5b at injection or missteering at 27.6 GeV. C5b upper edge blackened.

- New radiation monitors:
  - Peltier-cooled Si diodes with threshold-free current integration and charge-to-frequency conversion.
  - 7 diodes installed at $z = -66, -135$ cm.
  - Receiver board prototype ready.

- Pb shield:
  - 2 mm Pb shield installed around beam pipe under and behind BST repeater (-78 to -135 cm).
  - BST acceptance not affected.
  - 0.4 X_0 in front of BPC and Spacal up to $R = 18$ cm.
  - Shields CST voltage regulators and BST repeater.
  - CJC SynRad rate reduced by factor 4 (C5a).



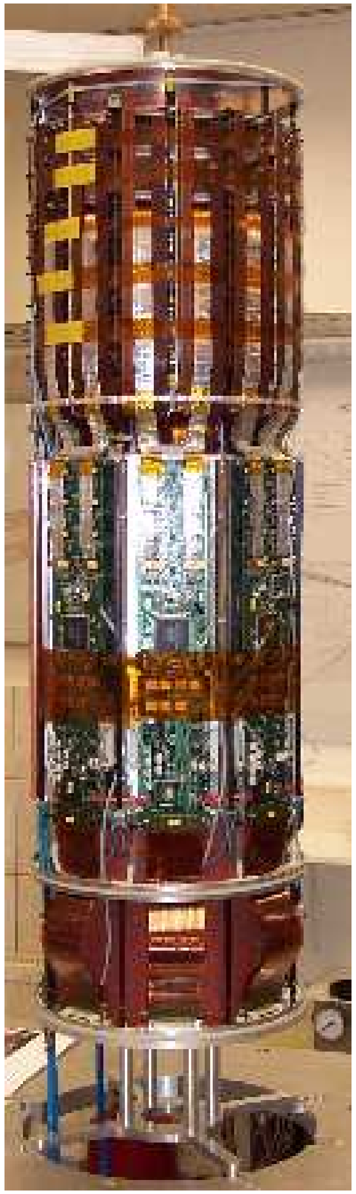
CST

CST installation with raised GG magnet:

Raphael Baldinger and Benno List

- Exported for repair to PSI.
- Remaining 6 (of 32) silicon ladders equipped with radiation hard frontend electronics (DMILL-APCs).
- 64 radiation damaged voltage regulators at $z = -1.35\,\mathrm{m}$ exchanged.
- Cooling water flow improved with wider internal supply tubes.

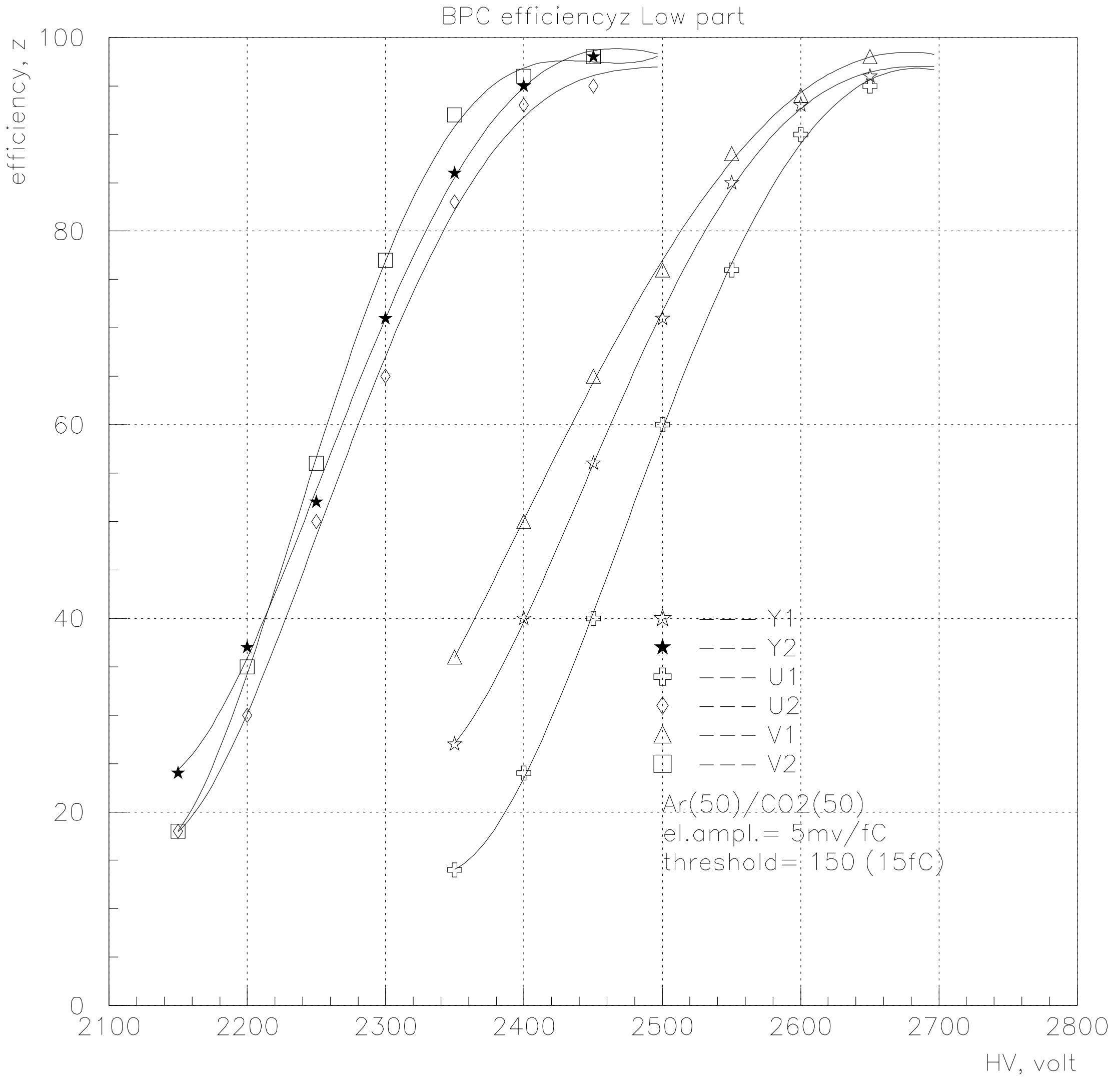
BST



- 72 old R-sensors replaced by φ-sensors (planned).
- 30 radiation damaged sensors replaced (not planned).
- 11 of 12 planes equipped.
- New repeater electronics for Pad detector and trigger.
- Clock receiver and distributors replaced by commercial radiation resistant versions.
- Damaged water connection replaced.
- BST installed Wed 4.6. (critical path).
  Fully operational.

BPC

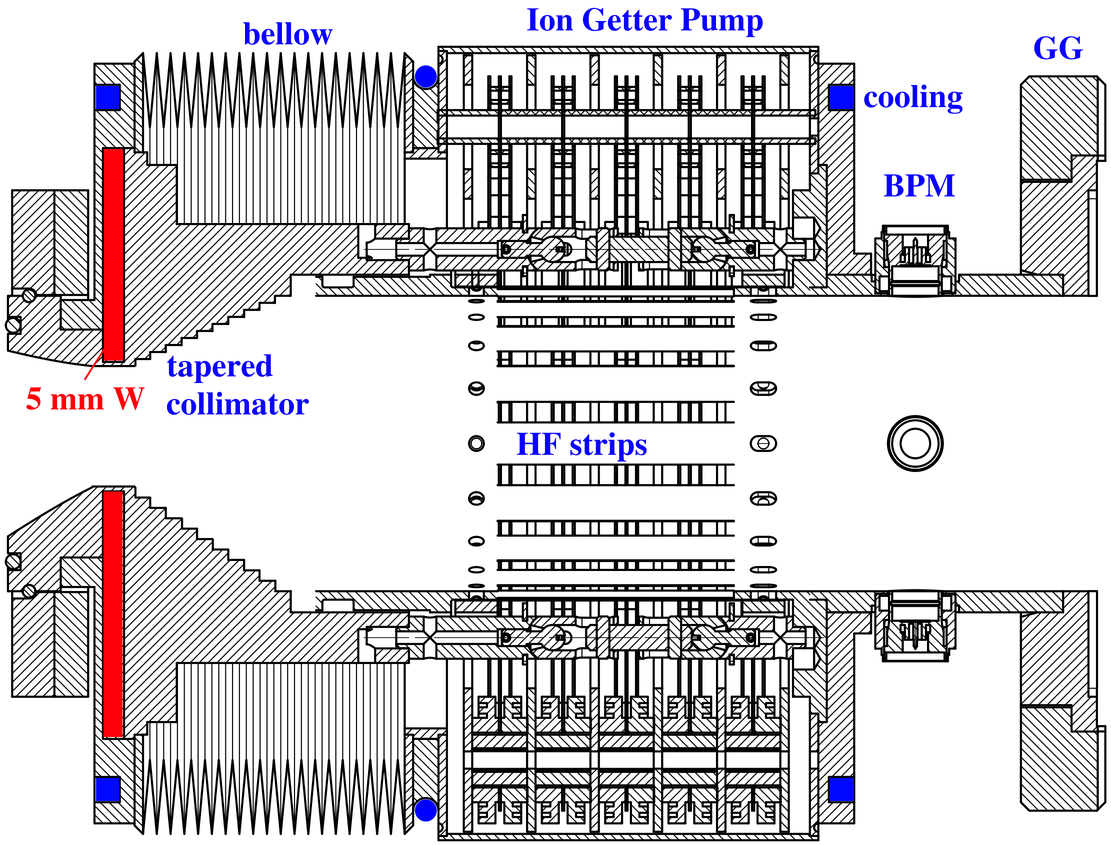
Cosmics HV-curves:



- Repaired by Dubna group in hall 5.
- Gas tightness improved with different O-ring and glueing. N_2 contamination reduced from 10% to 0.4%.
- Electronics: 5 of 22 frontend boards repaired or exchanged. Main damage by operation in bad beam conditions in Dec 2001.
- Extensive cosmics test done. Efficiency 95–98% in all 12 layers.

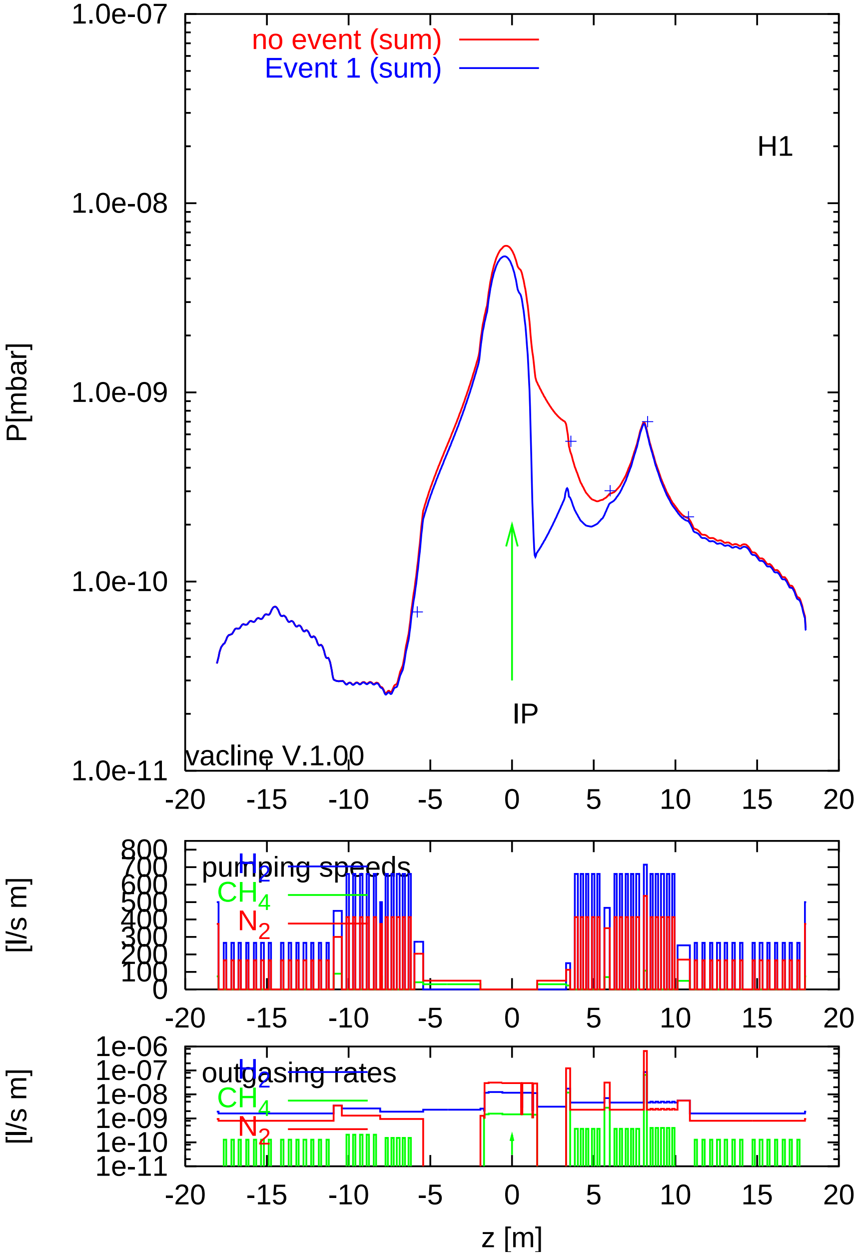
New C5b collimator with integrated ion getter pump

Under BPC at $z = -1.45\,\text{m}$:



- 5 mm tungsten plate outside of stainless steel beam pipe.
- Add taper to reduce higher order mode heating by 15–30%
- Add water cooling to reduce temperature peaks at injection.
- Add an integrated ion getter pump with $400\,\ell/\text{s}$.
- After assembly: 4 day bakeout at 148^oC.
- Pump tested OK in 1.16 T field.

Pressure profile and new H1 IGP



- Pressure profile simulation for 2002 in red.
- Adding a 400 l/s ion getter pump at 1.5 m right of the IP produces a sharp minimum, extending into the GG magnet.
- Folding with the CJC sensitivity we expect a reduction of 1/3 in chamber currents.

Further work on vacuum system

- 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: replaced 75 ℓ/s by 150 ℓ/s pumps.

- Rest gas analyzers at -3.6 and -6.0 m installed, for in-beam diagnostics.

- Coating of main SynRad absorber: 10 μm Cu and 100 μm Mo reduces backscattering by factor 1.7.
  Critical soldering at 800^{o}C not successful so far.
  Ready in time? Will we wait?

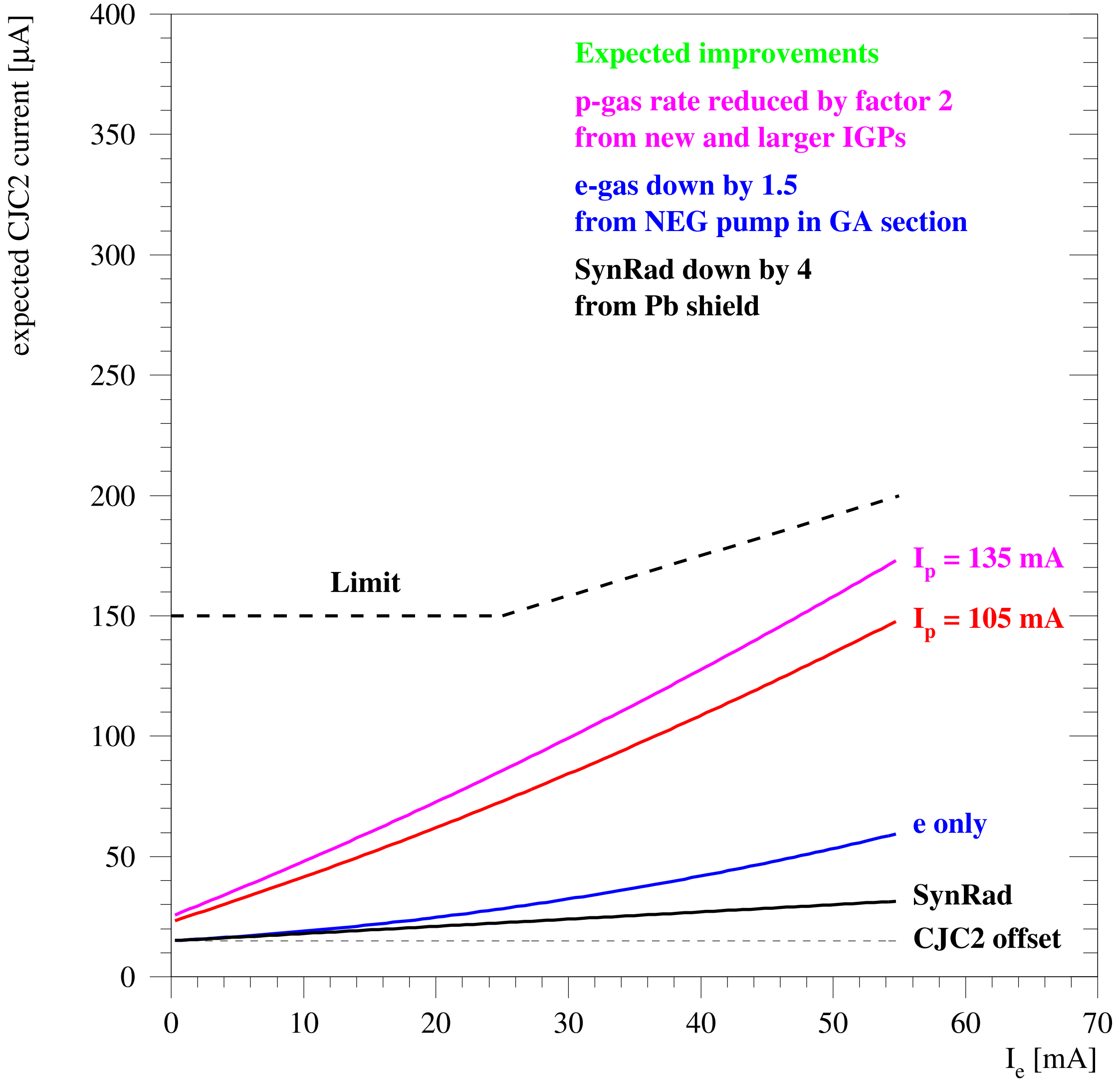
- RF fingers in e-beam pipe NL up to spin rotators now protected by Cu rings against SynRad.

- Temperature sensors were installed on critical flanges.

- e-beam pipe in GA magnet (NL 28–33 m) equipped with NEG pump.
  Expect e-gas background reduction by 1.5.

- Movable SynRad collimator at NL 66 m installed.

Improved extrapolated chamber current



Assumptions:

- 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.

CDAQ and DCM

- CDAQ stability must be increased, with all new systems included.
- Short term: improve diagnostics and feedback for shift crews and experts.
- Supervisor performs status check as 'fast Warmstart'.
- Supervisor resets branches after crash.
- Mid-term option: replace Taxi optical ring by Gigabit Ethernet links between commercial VME CPUs.
  Don't change the interface for the subsystems.
- Günter Eckerlin coordinates.

- Unified under PVSS:
  ◊ Tracker HV
  ◊ Spacal HV
  ◊ Lumi run control
  ◊ FPS Roman pot control
- underway:
  ◊ VFPS Roman pot control.
  ◊ Digital Muon HV control, gas monitoring to be tested in cosmics run.
  ◊ LAr HV control to be tested this summer.
- to be done:
  ◦ Silicons
  ◦ ToF and Veto
- Sven Karstensen coordinates.

Infrastructure and Maintenance

- Giga-bit ethernet optical link from RZ to HN intalled.
- Network extended into H1 hall.
- File server (2 TB) for backup data logging ordered.
- Air conditioning in room 407 and gas room 601 installed.
- Yearly maintenance for kryo and vacuum pumps done.
- Liquid N_2 krogenerator in repair.
- Air compressor for LAr analog box cooling replaced.
- Alarm systems test underway.
- General interlock and Not-Aus test 7.-18.7.
- Systematic change of crate and rack cooling fans underway.

Startup

H1:

- 2 weeks cosmics run 4.–18.7.:
  - Commission the CIP trigger.
  - Alignment and calibrations.
- Autumn:
  - Commission FTT L1 $\leftrightarrow$ DCRϕ.
  - Commission VFPS.
  - Establish trigger mix.

HERA:

- Startup beams 19.7.
- Vacuum conditioning in August.
- Setup pol and lumi: September.
- Pol. lumi run: 19.9.–17.12.2003.
- Increase number of bunches as backgrounds allow.

Summary

- A successful 4 month shutdown is almost finished.
- All upgrade projects (except for the Jet Trigger and FTI-1) are installed and operational.
- We have the best H1 detector ever!
- Let's collect $1\,\mathrm{fb}^{-1}$!

The technical team

- Karsten Gadow
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- Karen Tröger
- Hans-Jürgen Küsel
- Beata Liss
- Torsten Külper
- Agnes Guddat
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- Albert Schleiermacher
- Andrei Schleiermacher
- Ryszard Pyziol
- Bogdan Dabrowski
- Alexander Elisseev