

H1 Status



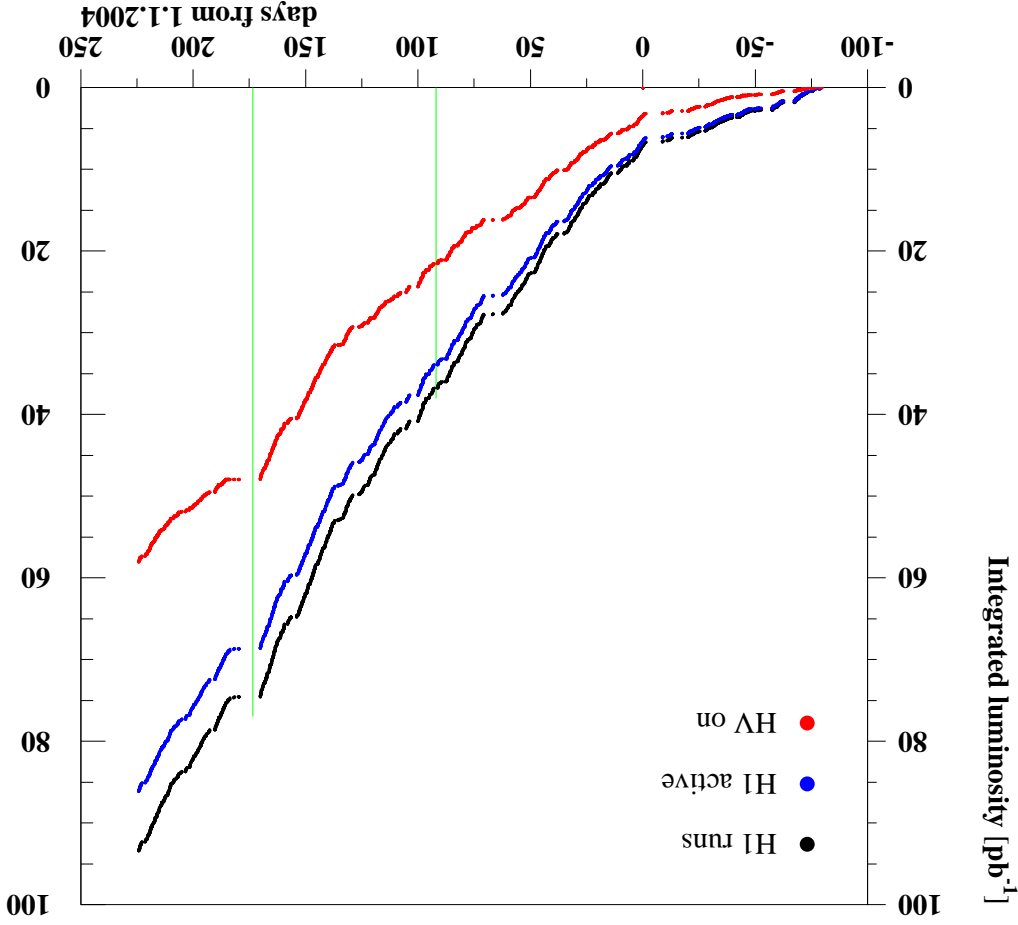
Daniel Pitzl, DESY

HERA coordination meeting, 5.10.2004

- Luminosity update
- Silicon detectors
- Shutdown completed

Luminosity collection 2003-2004

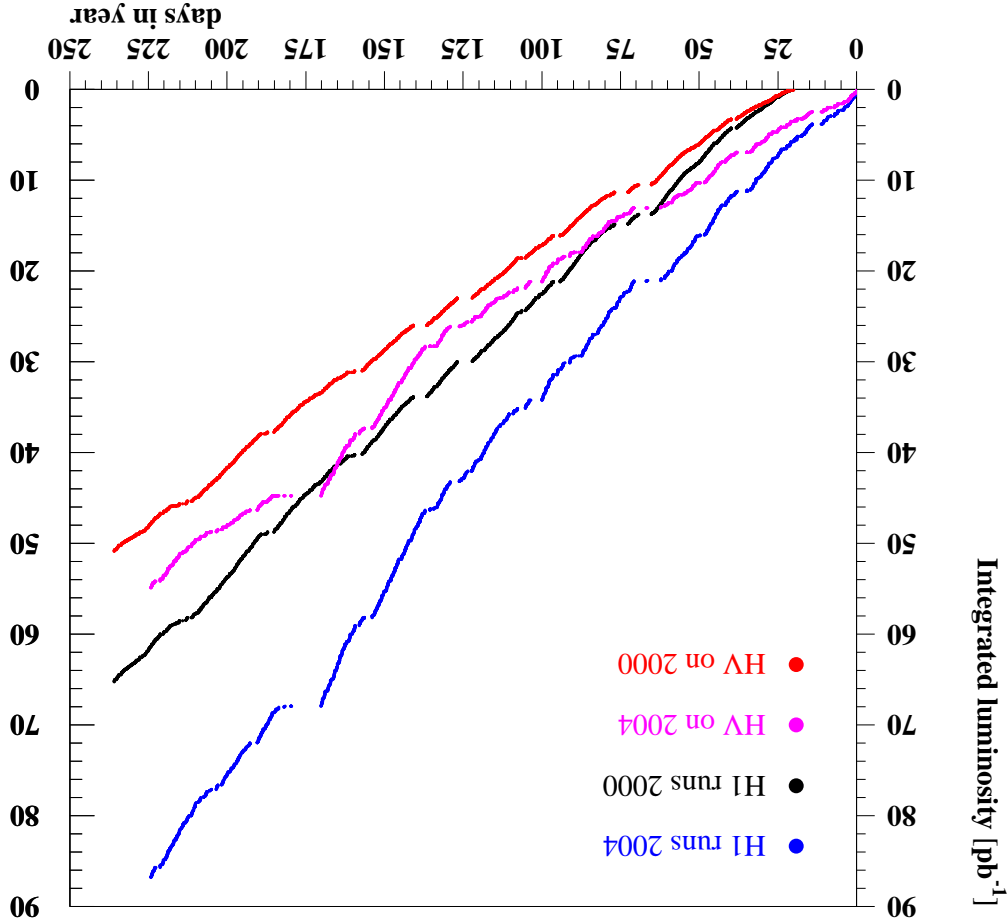
With offline corrections:



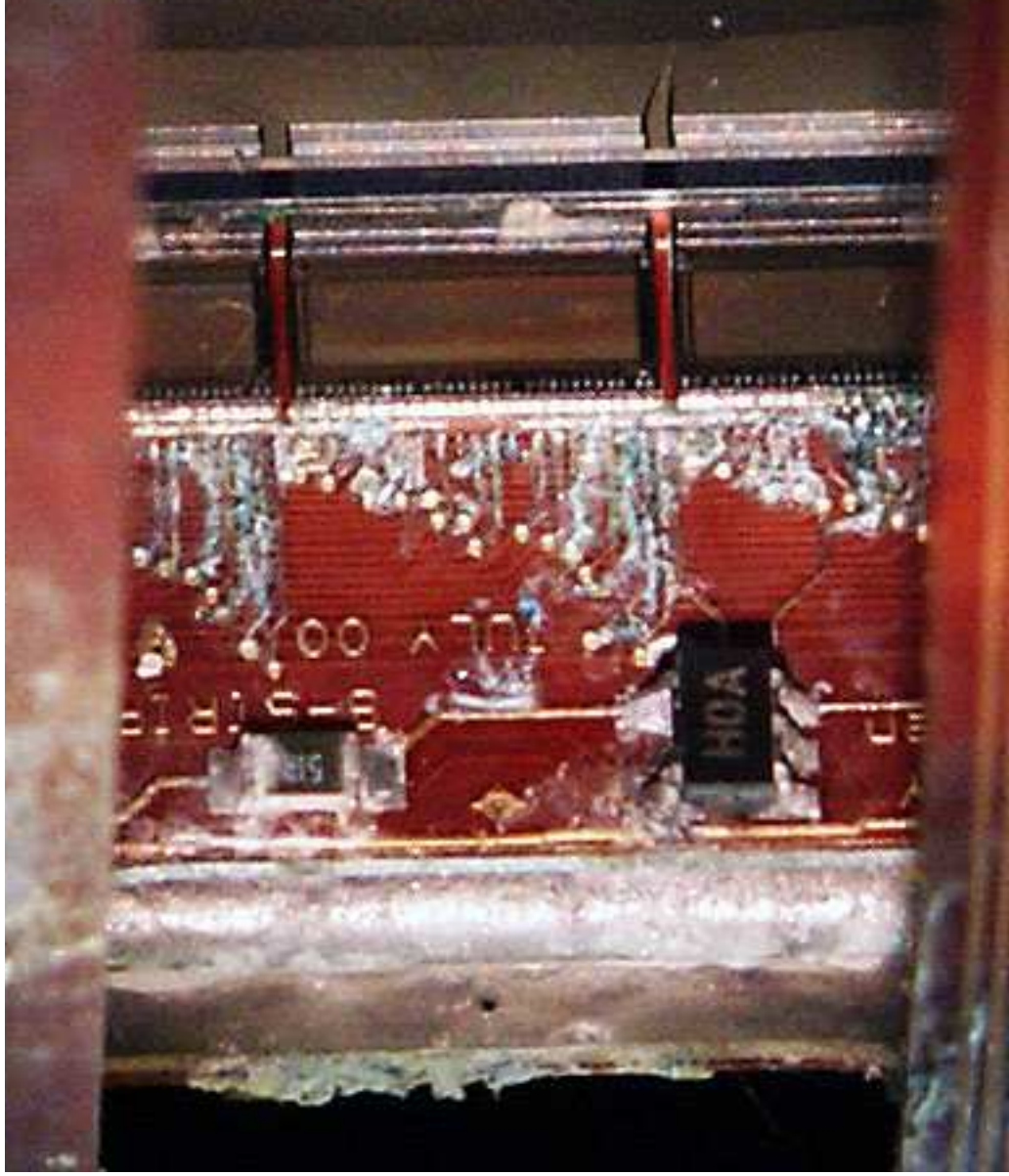
- HERA delivered: 99 pb⁻¹
- H1 DAQ running: 93 pb⁻¹
94.6% average DAQ efficiency.
- H1 pipeline active: 86 pb⁻¹
8.0% average deadtime.
- CJCI,2 and CIP full HV: 58 pb⁻¹
67% average HV efficiency.
- Two helicity flips.
- 97.5 M events on tape.

2004 compared to 2000

- HERA delivered: 91 pb⁻¹
- HERA duty cycle: 39% in 2000: 56%
- Peak luminosity: 3.7 · 10³¹ cm²/s Best in 2000 was 1.8 · 10³¹ cm²/s
- Specific lumi 1.2–1.5 · 10³⁰ cm²/s/mA² Typical 2000: 0.7 · 10³⁰ cm²/s/mA²
- H1 HV efficiency was 69% on average, compared to 85% in 2000.



H1 Forward Silicon Tracker: water damage



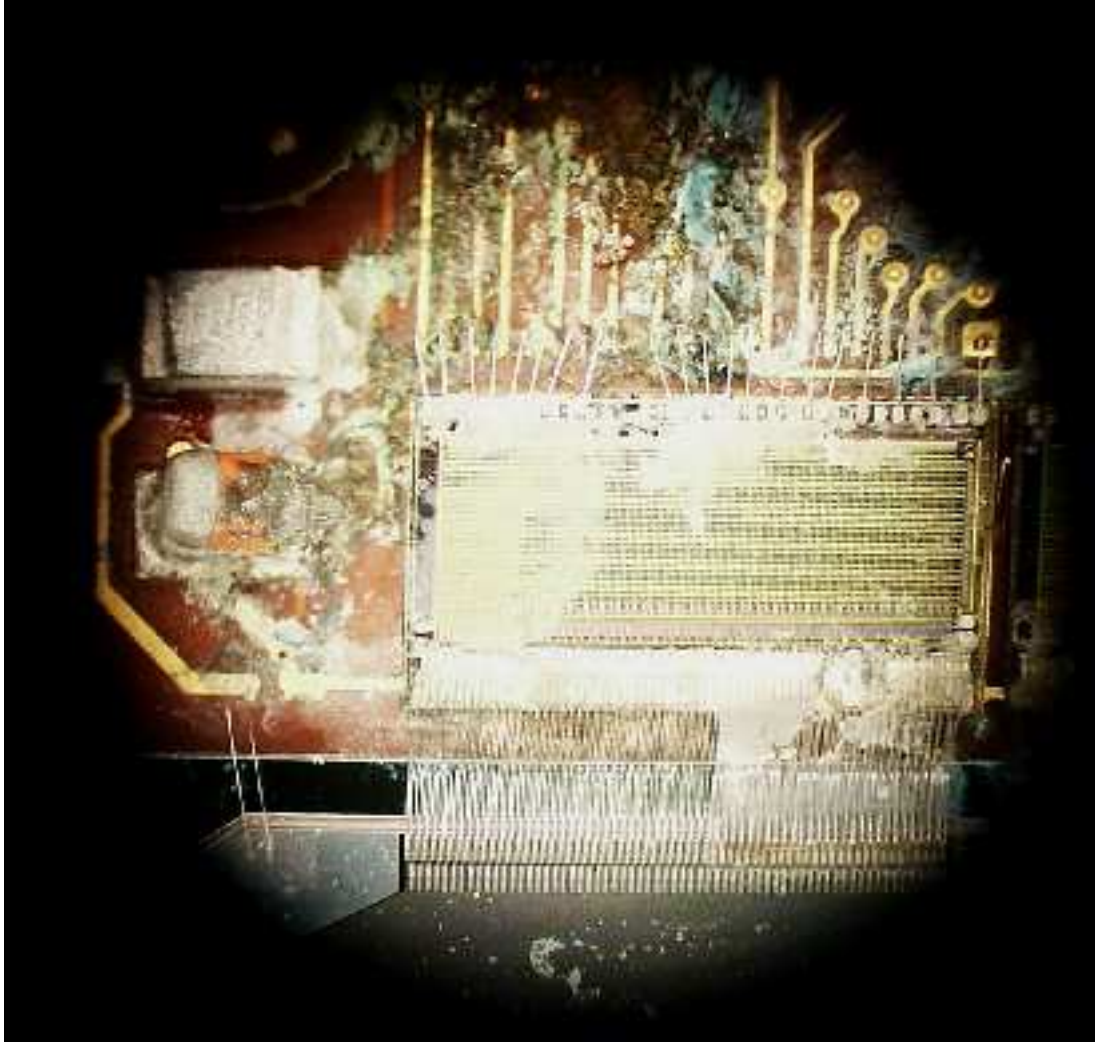
- Corrosion of Cu traces on PCBs.
- Most likely caused by small water leak. Chemistry under investigation.
- H1 check lists indicate a loss of 0.8ℓ cooling water in April–May 2004.

FST: water damage



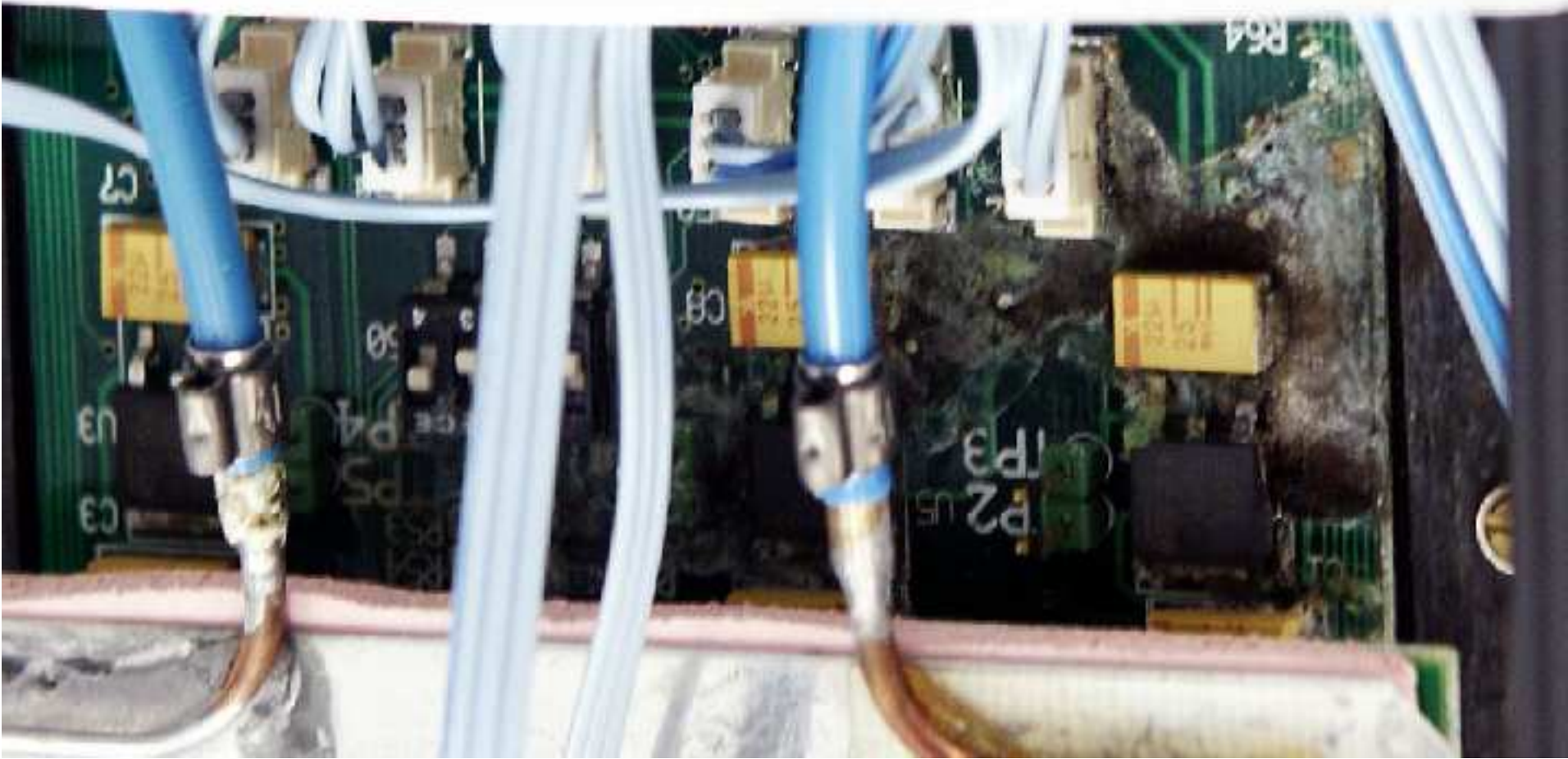
- 4 of 7 wheels have corroded hybrids.
- Consistent with the damage pattern observed in May 2004.
- Corroded wheels have good water flow: condensation.
- Clean wheels have blocked cooling pipes.
- Radiation dose 2003–2004: ≈ 50 Gy, total ≈ 80 Gy since 2001.
- SacMOS readout chips degrade after 100–150 Gy, dead after 300 Gy.

Damaged FST under the microscope



- Corrosion on hybrid traces.
- Deposits on APC readout chip.
- Damage to Si sensor bond pads likely.

Crimped connection of blue plastic water tube to Cu pipe.



FST leak was here



FST: leaky connection

- Bad crimp connection.
- Developed leak after 3 years of operation.

H1 Backward Silicon Tracker: blocked cooling pipes

- 3 of 6 BST Pad repeater boards have blocked cooling pipes: noisy pad trigger regions.
 - One strip repeater was not cooled: inefficient tracking.
 - 6 of 10 Si wheels are badly cooled. Dosimeters: 25–58 Gy. SacMOS readout chips degrade after 100–150 Gy, dead after 300 Gy.
- ⇒ BST stays for repair in Zeuthen.

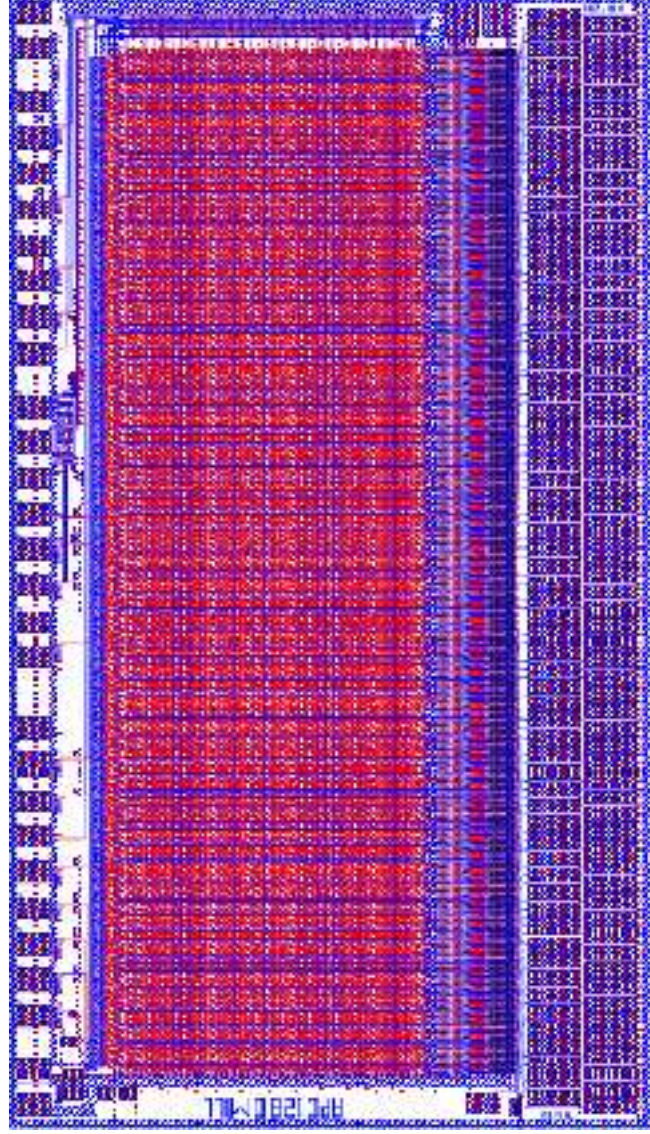


FST and BST repair plans

- Order new Si sensors for FST (need 120) at CIS Erfurt. Production capacity available.
- Order new hybrids. Prepare bonding.
- Tests on possible radiation damage underway in Zeuthen.
- Design of radiation hard readout chip underway at Heidelberg ASIC lab.
- Rebuild cooling manifolds.
- Consider different cooling medium.
- Install repaired FST and BST in the 2005 summer shutdown.
- FST and BST will then be in place to collect a large fraction of the expected HERA II luminosity.

New FST/BST readout chip

- Radiation resistant readout chip wanted.
- CST version (DMILL) not available anymore.
- R. Horisberger: use $0.25\ \mu\text{m}$ CMOS technology with PSI radiation hard design library.
- Design underway (I. Tsurin) at Heidelberg ASIC lab.
- Still to be done: digital Decoder chip.
- Goal: verified layout by end of this month.



Amplifier and pipeline chip AP C128

New background monitor: BSToF

- Instead of BST Pad radiation monitor at $z = -35$ m.

- $R = 6$ cm to 14 cm.

- One scintillator plane, $d = 2$ cm.

- 8-fold ϕ segmentation.

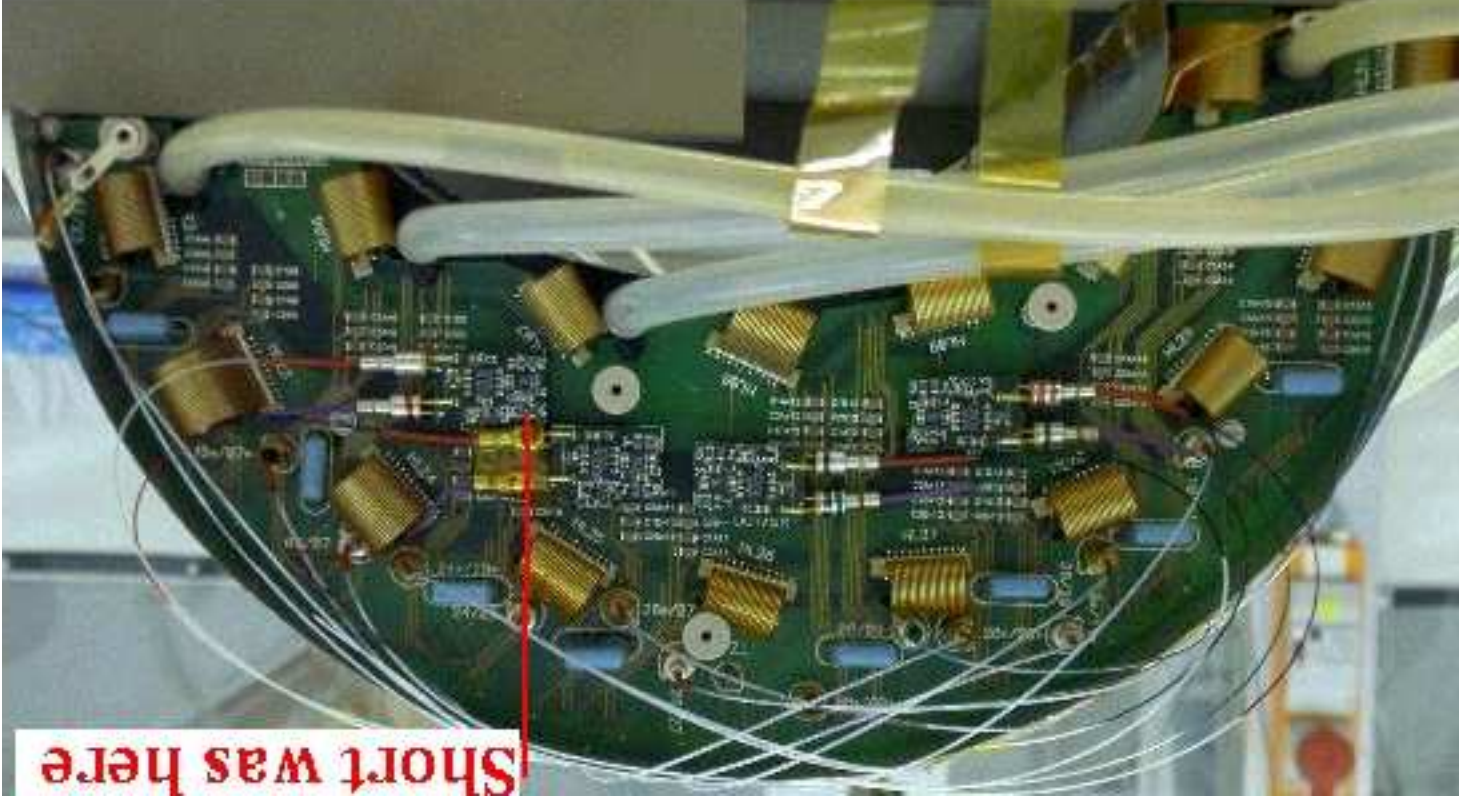
- Spacial PM readout.

- CFK support.

- Will provide total H1 background rate, with sensitivity to e , p , and γ .

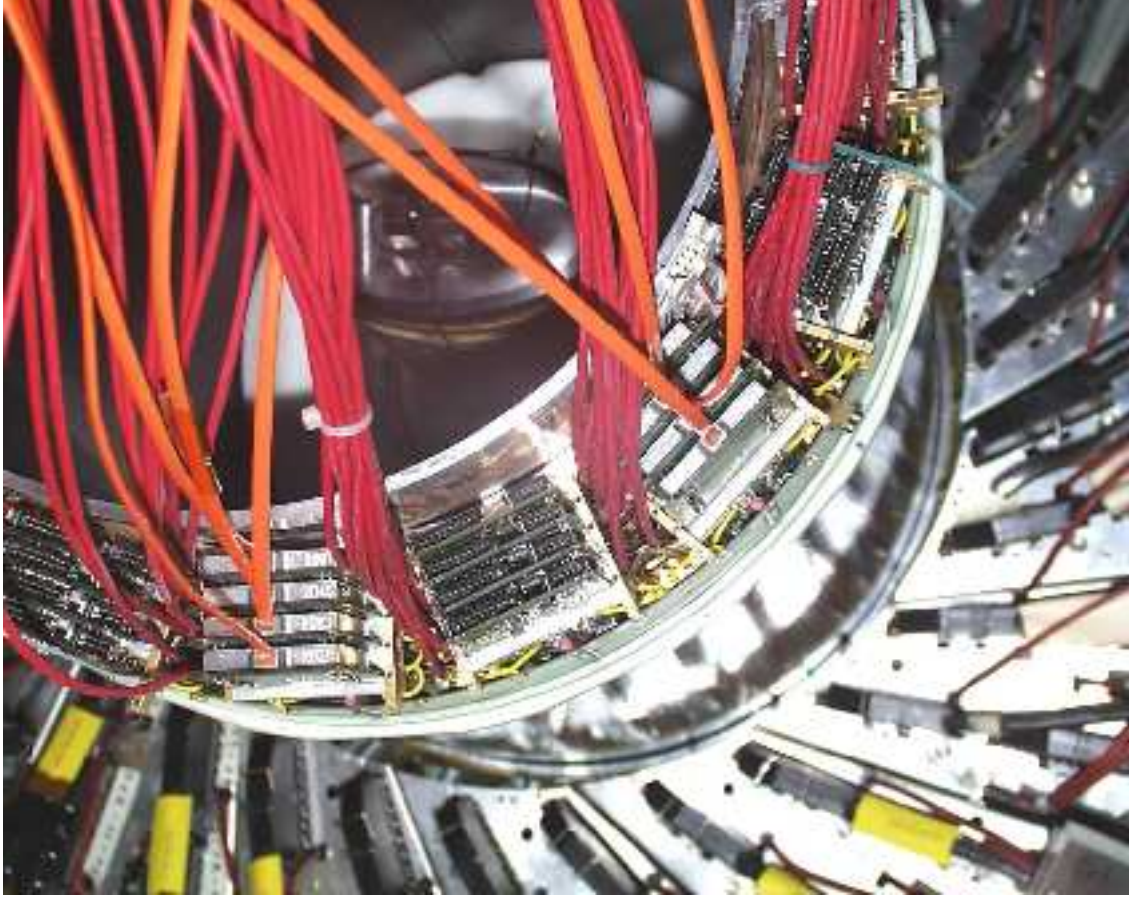


- Short between clock receiver diode and adjacent PCB caused dead quadrant. Insulated.
- CST dose was moderate (12–64 Gy).



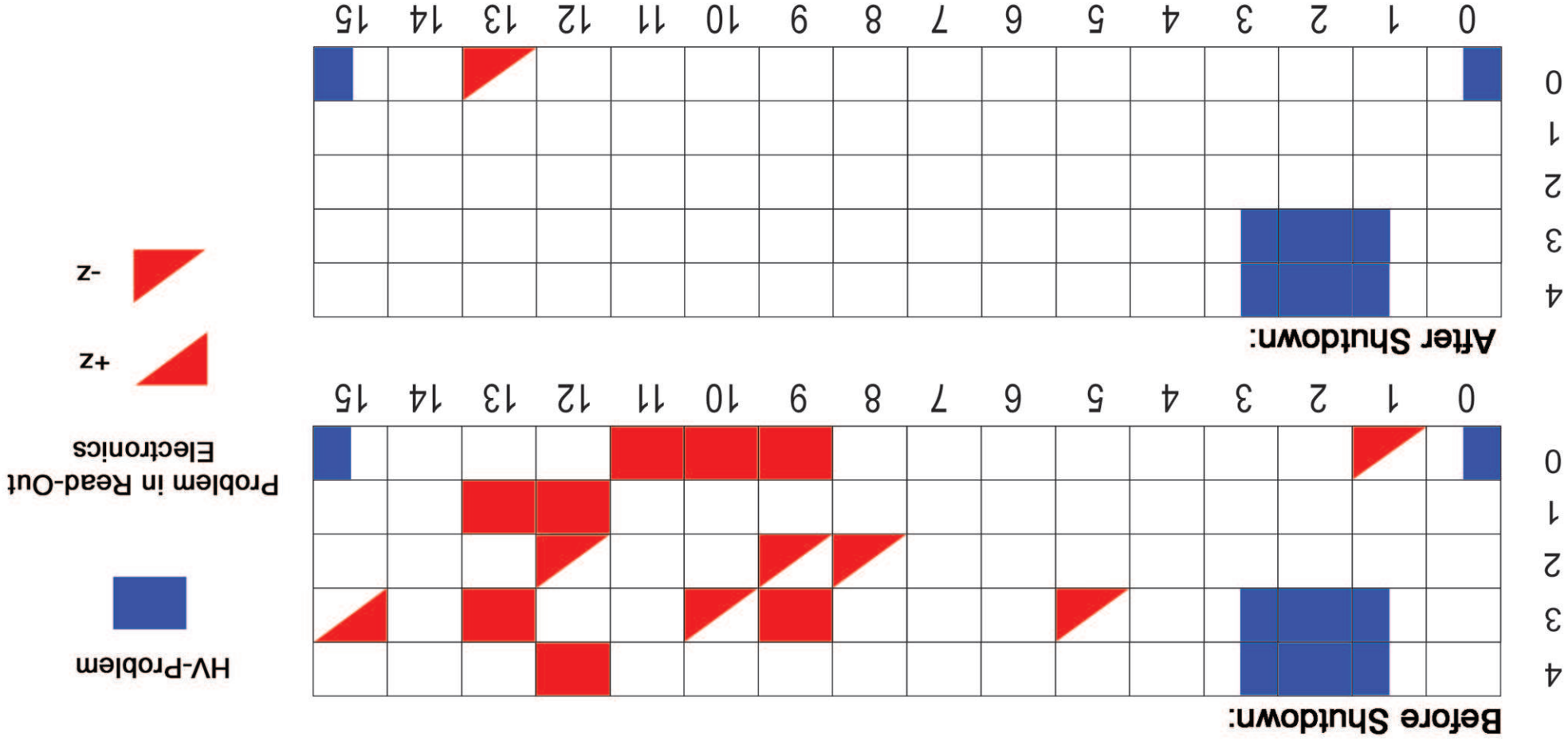
CST repaired

CIP repaired



- Shutdown schedule allowed 10 days for work on CIP.
- All faulty frontend PCBs repaired:
 - 2 optical hybrids exchanged.
 - 4 voltage regulators exchanged.
 - 4 optical cables exchanged.
- Most faults were already present after 2003 installation.
- The HV problems (broken wires) can only be solved by moving H1 into parking position: half year shutdown.

CIP repair of problematic readout sectors



Sectors with electronic problems reduced from 15 to 1 (out of 80).

CIP trigger will have higher redundancy and increased efficiency with a 3-of-5 algorithm per ϕ -sector.

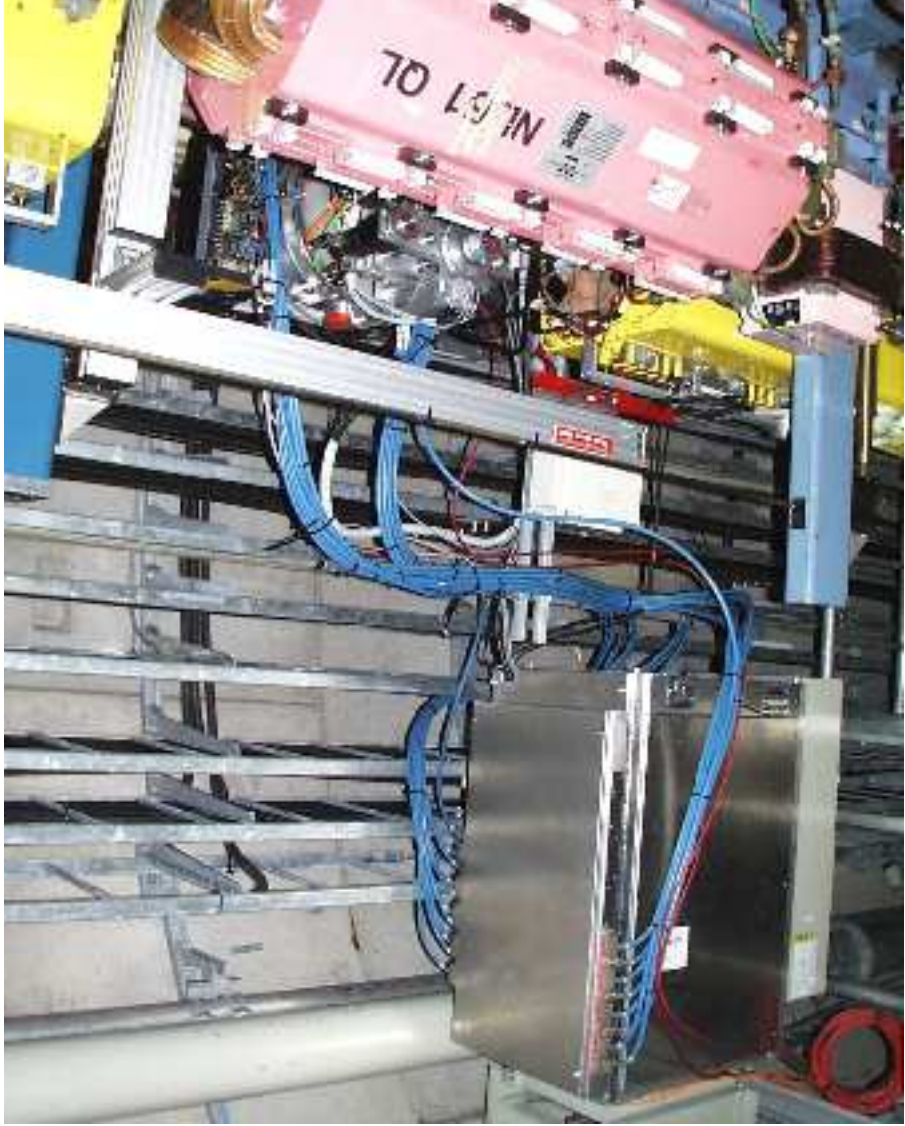
New FPS Roman Pots



- New pots, new beam pipes, new moving system, unified with VFPS at 220 m.
- All stations installed: 61, 80/81, and 90 m.
- All stations passed vacuum test.
- Pb shielding still to be installed.
- Mu-metal shielding for PSPMs will be installed if necessary.

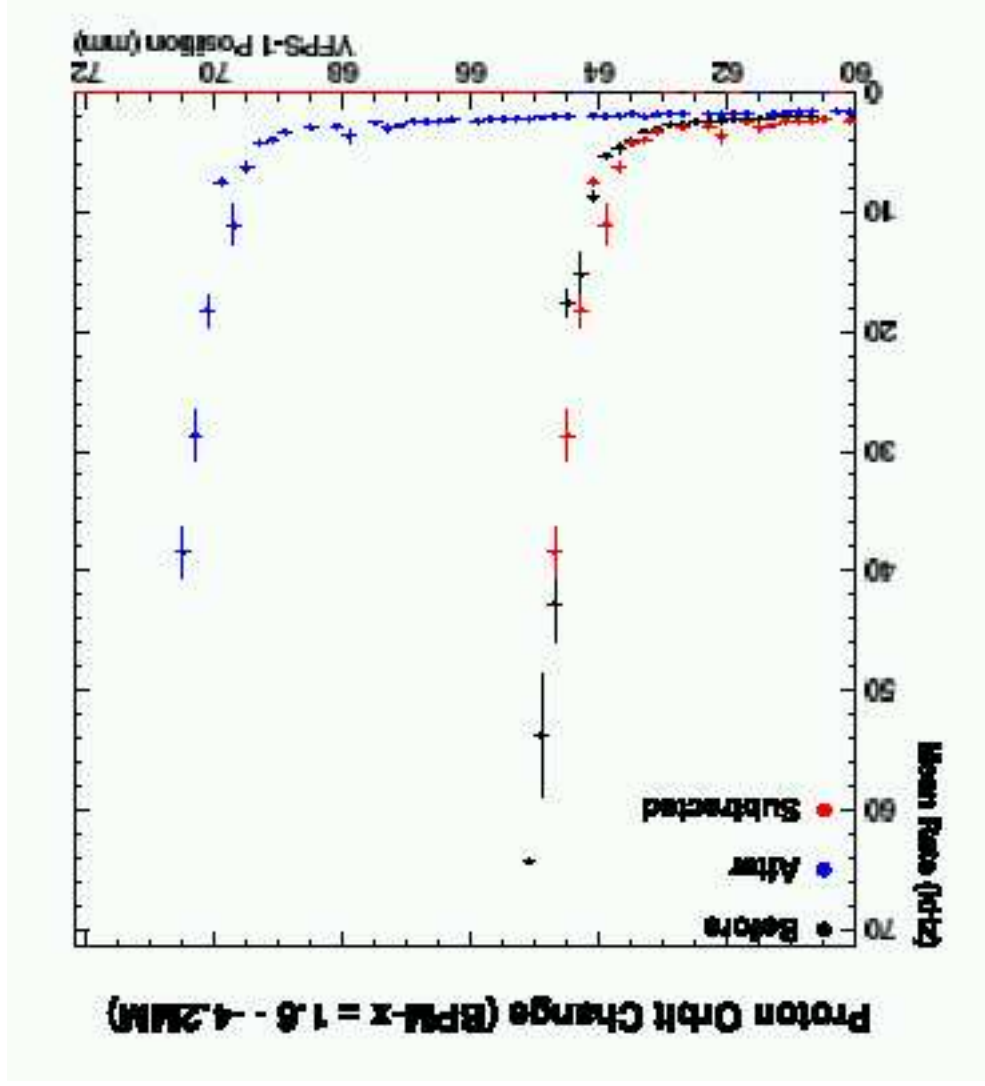
80/81 m horizontal and vertical pots.

FPS 61 m horizontal and 90 m vertical station



VFPS

- No problems with kryogenic bypass and warm beam pipe section.
- VFPS trigger signal arrives in time for L1 via fast air-core cable.
- Background rates appear acceptable.
- 5.8 mm p orbit bump for increased acceptance was tested OK with HERA.
- Optical readout cables are now placed under the tunnel concrete floor for radiation protection.
- Ready for physics data taking.



H1 shutdown completed

- BST and FST removed for repair in Zeuthen.
- CST dead quadrant repaired.
- CIP: several dead sectors repaired.
- EM Spacal: a few dead channels repaired.
- FPS: new pots and steering mechanism, as in VFPS.
- Improvements on FNC, FTS, Muons.
- New Ethernet-based central data acquisition system.
- New CAEN HV supply for the CJC with finer trip limits and better current monitoring.
- New central Slow Control system.
- H1 was closed on scheduled on 30.9.2004.

H1 Planning

- Cosmics run: 4.–13.10.2004
- Hibernation until mid November.
- Back with shifts for test lumi runs from 20.11.2004
- H1 will be ready for e_p lumi operation.
- The background conditions are expected to be difficult due to the long venting period and the new G12 beampipe.
- H1 will be operated over New Year if some meaningful lumi collection can be expected.