

HERA-B : Ten Years after (or was it eleven ??)

retrospective debris

Bernhard Schmidt
CERN
18.2.2015

how all began in Misty Ages...



how all began in Misty Ages...

An Experiment to Study CP Violation in the B System Using an Internal Target at the HERA Proton Ring

Proposal by 32 brave men :1992

H. Albrecht, H. Kapitza, O. Mai, H. Schröder, H.D. Schulz, R. Wurth
DESY, Hamburg, Germany

H. Kolanoski, R. Mankel, B. Spaan
Institut für Physik, Universität Dortmund, Germany

R. Mund, T. Öst, R. Reiner, W. Schmidt-Parzefall
II. Institut für Experimentalphysik, Universität Hamburg, Germany

W. Hofmann, S. Khan, K.T. Knöpfle, T. Lohse, M. Seeger, M. Spahn, J. Spengler
Max-Planck-Institut für Kernphysik, Heidelberg, Germany

V. Pugatch
Institute for Nuclear Research, Ukrainian Academy of Science, Kiev, Ukraine

V. Cindro, G. Kernel, P. Križan, E. Križnič, M. Starič
Institut J. Stefan and Oddelek za fiziko, Univerza v Ljubljani, Ljubljana, Slovenia

R. Männer, F. Klefenz
Institut für Informatik, Universität Mannheim, Germany

I. Belyaev, M. Danilov, Yu. Gerstein, F. Khasanov, S. Semenov, A. Snijko, I. Tichomirov,
Yu. Zaitsev

Institute of Theoretical and Experimental Physics, Moscow, Russia

G. Bohm, S. Novak, M. Walter
DESY-Institut für Hochenergiephysik, Zeuthen, Germany

Contact Persons

W. Hofmann, *MPI für Kernphysik, Heidelberg*
W. Schmidt-Parzefall, *Universität Hamburg*



how all began in Misty Ages...



how all began in Misty Ages...

From schwarza@x4u2.desy.de Mon Jun 20 09:01:42 1994

Dear Collaborator,
below please find the text stating the conditional approval of the
HERA-B experiment.

A busy time lies ahead of us!

Regards,
Andreas.

Approval !

----- Forwarded message -----

Date: Sun, 19 Jun 1994 14:35:39 +0100

From: Albrecht Wagner

To: "Andreas S. Schwarz"

Subject: Conditional Approval - english text

Albrecht Wagner

- F -

Hamburg, 17.6.1994

Re: Conditional Approval of HERA-b

Hall- West still empty



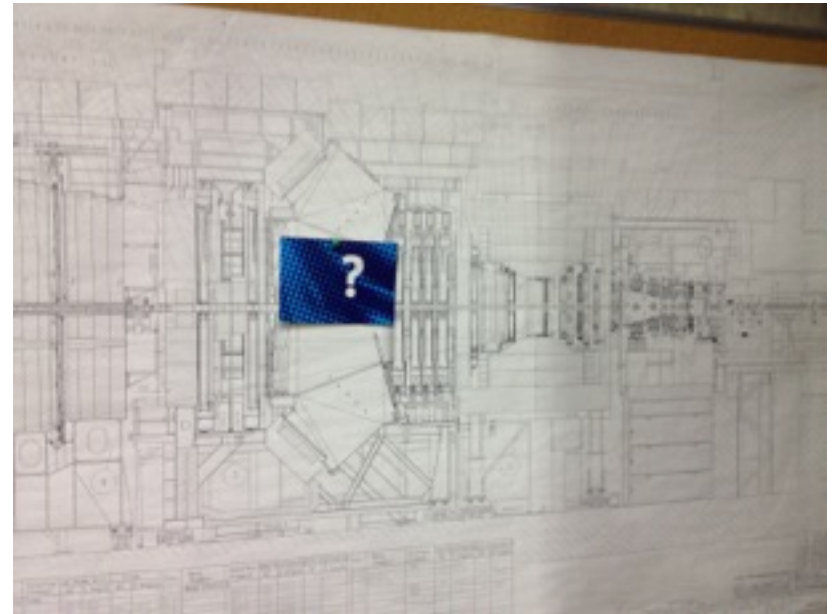
Hall West filling with glory and pride



three years later: 1998

Feb 16., 2015

there are signs on the wall but she wants to be sure..

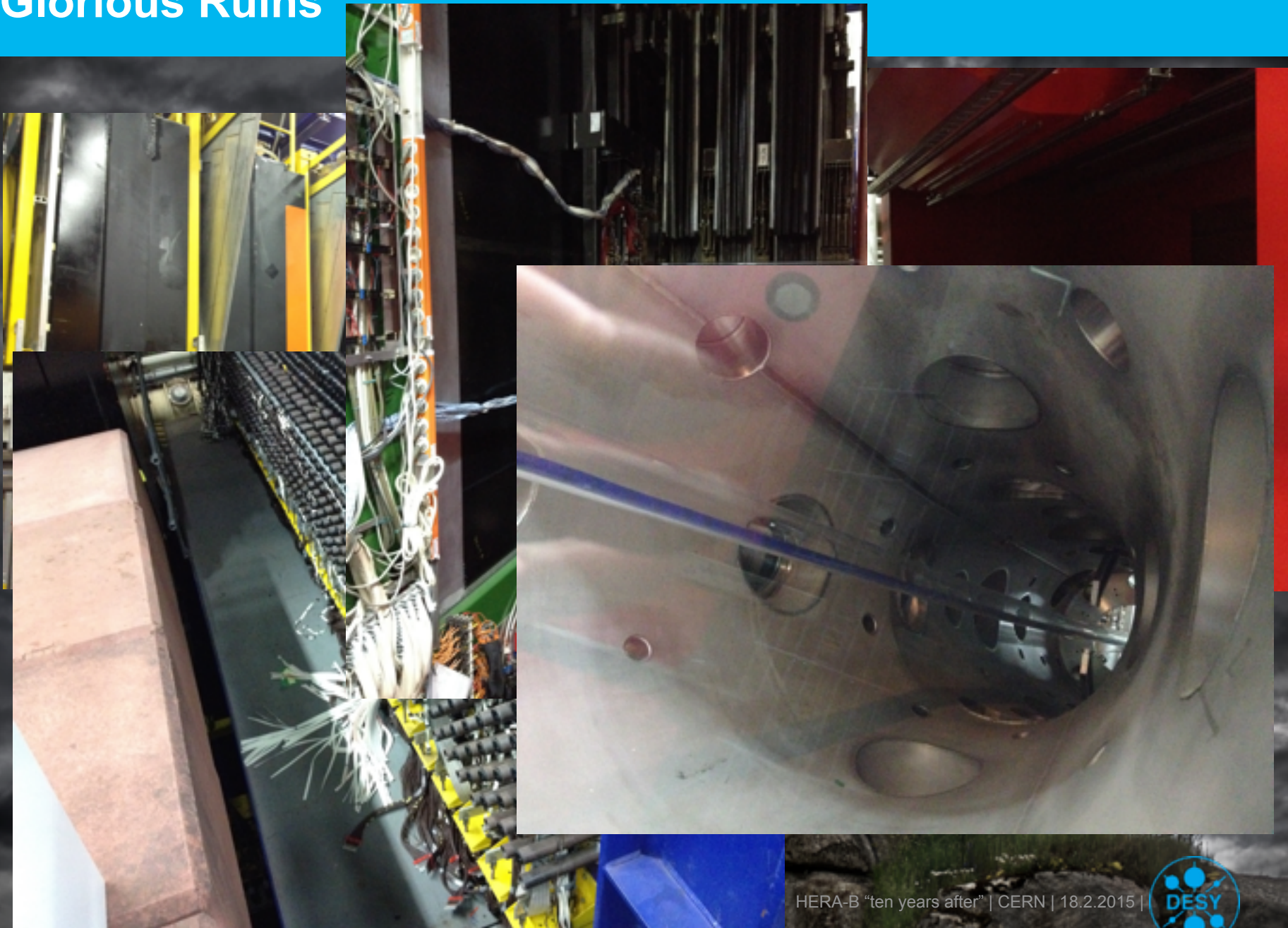


no fudge !

Glorious Ruins



Glorious Ruins



HERA-B "ten years after" | CERN | 18.2.2015 |



back to 1995 :

Herrmann the visionary ?



predicting is dangerous

... especially into the future.



my holiday greetings from Brittany, 1997

predicting is dangerous

... especially into the future.



my holiday greetings from Brittany, 1997

the “deputy” in 2014



1996 : the (one of the) ITR crisis

1994 : start with 'conventional' MSGC on bare glass (the CMS base line !!!)

**1996 : induced discharges in HADRONIC beams
(test at PSI proton/pion beam ~1/3 HERA-B intensity)**



1996 : the (one of the) ITR crisis

1994 : start with 'conventional' MSGC on bare glass (the CMS base line !!!)

1996 : induced discharges in HADRONIC beams
(test at PSI proton/pion beam ~1/3 HERA-B intensity)

Franz Eisele working out the road to success

Fusion: Vor- + Nachteile

- 'robust' Lösung
- einfache Technologie: Feinmechanik
- schnell & grade - wenig keine Probleme..
- 'wartung frei'
- ~~Elektronen~~ Zufällig
- Detektorrisiko ist minimal

2. Lichtausbeute $\frac{N_{ph}}{N_{e}} > 4$ / Detektor im dunklen lsl. Transparenz

- Strahlenschäden..
- Initialisierungsprobleme
- fgr. wegen Lichtkathoden
- Auslastung im Protonen schwingen

* optische Kontakte sind kritisch

aktive Aufwand: Fast-Fürderung

ok Preis durch PPS ist nur im blauen gut!

fibers

MSGC - actions

- 1) Bellarini - beste Kammer Design erstellen
- 2) Welche Firmen könnten Technische herstellen
- 3) Gold + gedampfte Gr. $10 \times 10 \text{ cm}$ schreibt direkt 2 St. Febr. 96
- 4) Gold + gedampfte Ti
- 5) Neue Maske 10×10 - gleich gedr. Hochdruck Vakuum. Mäander + 2 Masken (Kontrollen)
- 6) ~~Ab = Petrusgesetz~~ Erste Zeichnung
- 7) Scani Elektronen: ablesen!
- 8) Cr + gelb. Maske
- 9) Vapour: gelbe Kammer... 30x50 + 144
- 10) Spice Simulationen
- 11) 'System test': Beladung, Beladung, Beladung
- 12) MSGC + Vakuum + Optimal + -Maske

U.S. -

MSGC

Silizium:

- S/N Verhältnisse (~Trigger)
- Pitch 100µm auslegen \rightarrow mehr Kanäle oder neue Elektroden
- Sidge Lösung: L & M cm statt 2k
- Plate entlang Z...

Profound Flexionen:

- Prod. stellen bei Firmen (zuc. ATLAS??)
- Produkt + Fertigungsort in Italien (230 Jahre)
- Feldtest Erfahrung in IT. Gruppe

Techn. Probl.: Kühlung.. / Strahlenschädigung /

- Standard Technologie, so gibt viele Ex'ist. Beispiele aber nicht mit 100 ns Zeitband, noch keine Trigger
- Risiko... gut abschätzbar.

Finanz. Aufwand: ~4.5 M\$

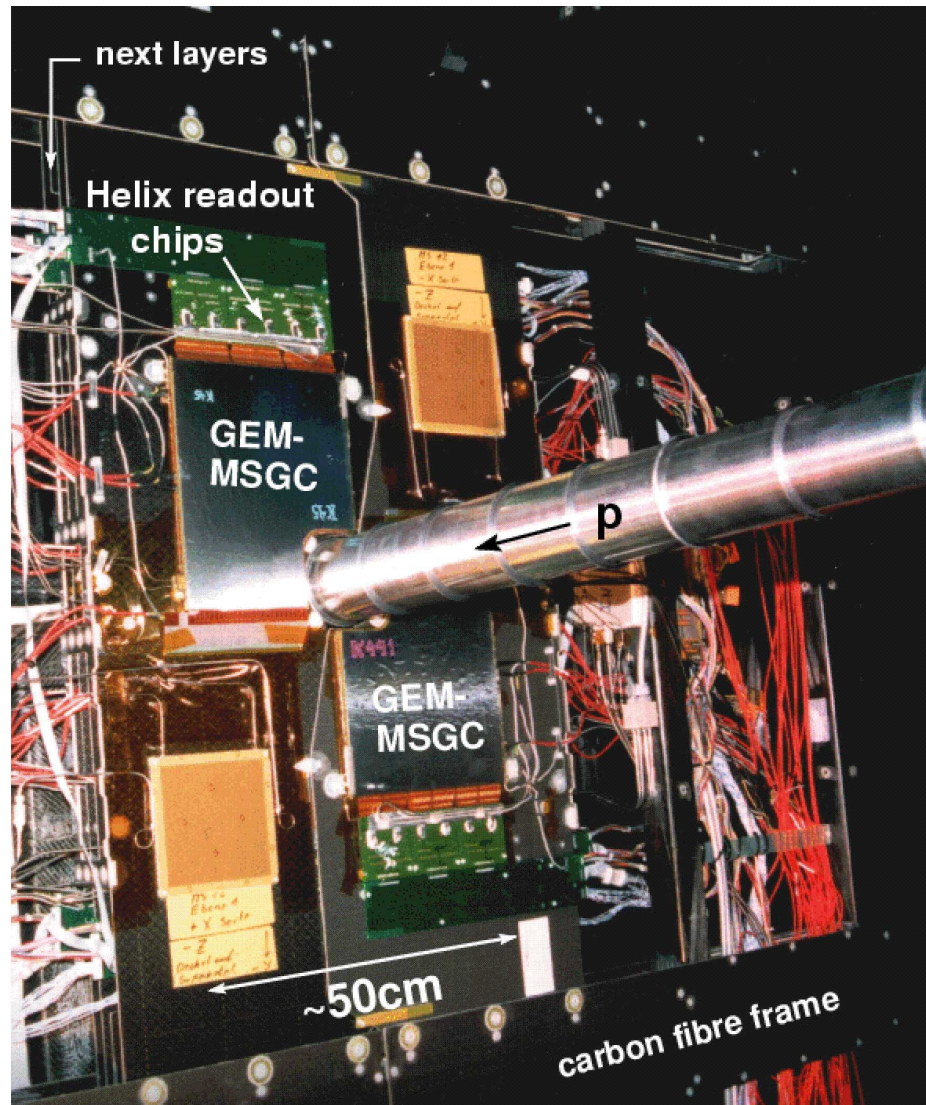
action: France Simulation dieser Lösung

W.H. "W.H.":

→ + arbeitslose Leute! nur Fortbildung + Optimierung einer Si-Lösung 'finden'

silicon

MSGC + GEM tracker



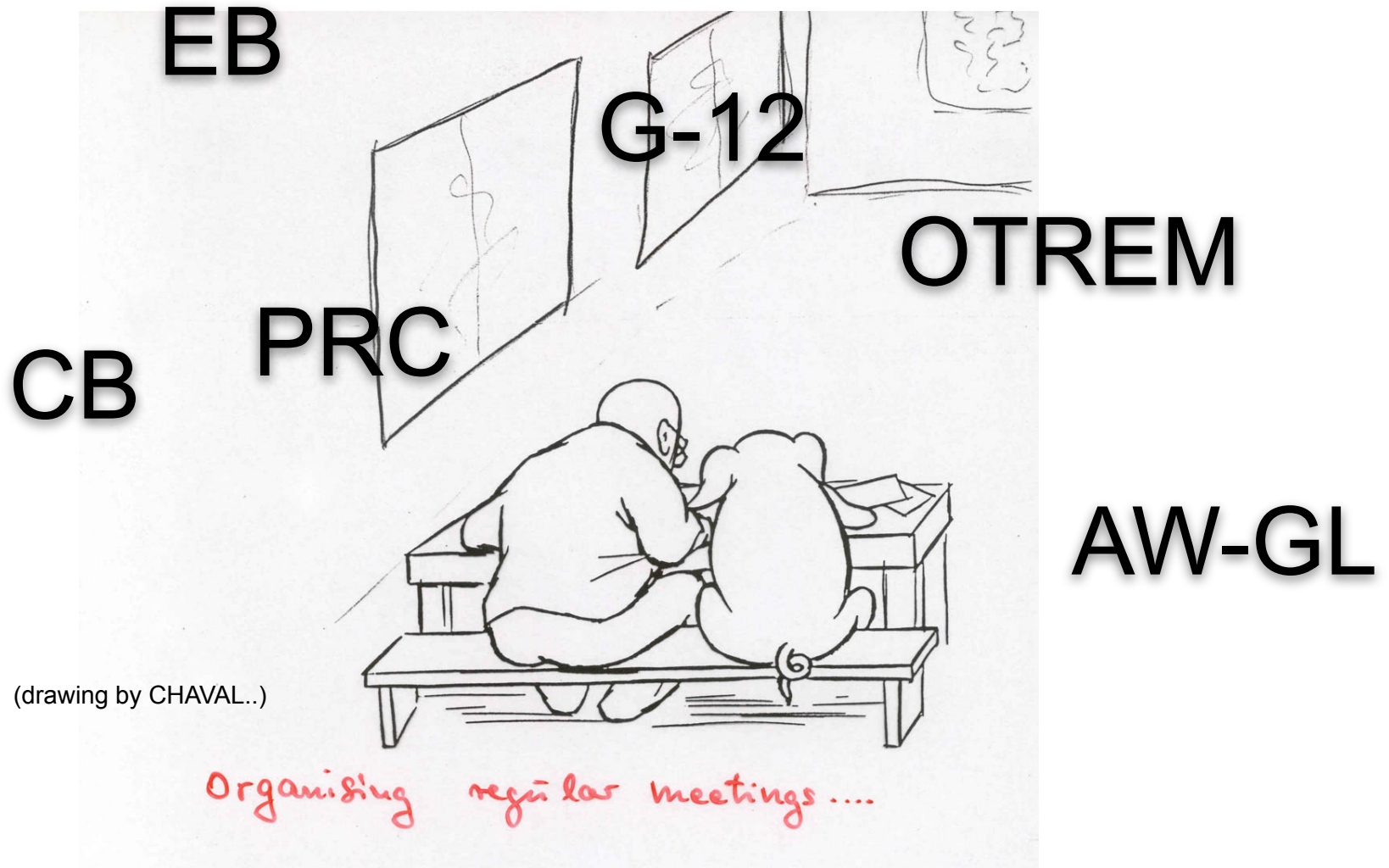
the worlds one and only large scale MSGC tracker



Major impact on design of LHC experiments !

- both, LHC-b and CMS gave up MSGC solution

elaborated meeting culture



The prospects of HERA-B in catchwords

15.12.98

Proton beam :

- + existing
- running efficiency (waiting for lumi declaration..)
- no beam halo (exciting the beam ?)
- coasting beam ! **potentially fatal**

ITR :

- + mass production running and uncritical
 - ? limited experience with chambers in HERA-B
 - ? HELIX base line fluctuations ?
 - ? Production yield of PCBs ?
 - ? Number of defects on MSGC ?
 - PSI mysterium not understood,
extrapolation to HERA-B unknown
- potentially fatal**

FLT :

- + hardware coming together
- + TFU bug could be fixed
- ? will TFU redesign work ?
- TFUs come late

? Will algorithm work in real world ?

potentially fatal

OTR :

- + substantial progress during last year
- + fundamental ageing problems solved (for test chambers)
- /+ mass production just starting, needs speed up,
man power, organisation ..
- time scale tough and fragile **Further delays ?**

? Ageing of full size chambers ?

? Clean room conditions in Peking ?

potentially fatal

Muon System :

- + all chambers build
 - commissioning slower than expected
 - pre-trigger boards not ready
 - pixel chamber (I,II) read out non operational
(man power !)
- Further delays ?**
- ageing with Ar-CF₄-CH₄ Mixture
- potentially fatal**

Software :

- + data logging ok
- + data quality monitor existing
- + digitisation and reconstruction in good shape
 - except ITR
- + tracking essentially ready
- alignment and calibration
needs input from subsystems
needs more man power

Could be severe bottleneck

RICH crisis, solved by \$\$\$\$

photon detection by “TMAE” chambers



(drawing by CHAVAL..)

~1000 multianode PM tubes

re-used for BLM system
@ E-XFEL

the OTR saga

- POKALON honeycomb chambers: **rapid** aging in hadronic beams

alternative straw tube design

July 19, 1999
Kerstin Hoepfner

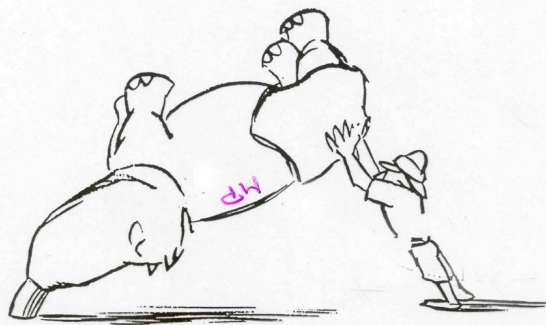
Status report: Hera-B Outer Tracker Chambers Based on Straw Tubes

Desy Hamburg: K.Hoepfner, W.Weiss, R.Wurth
JINR Dubna: A.Belkov, I.Golutvin, Y.Kiryushin, V.Samsonov, A.Vishnevsky
Mephi Moscow: J.Chamanina, V.Egorytchev, S.Furletov, V.Saveliev

honeycomb rescued by **17 kg gold** coating the anodes

this, and forgotten cabling: 4 MDM ➡ 14 MDM 🙄

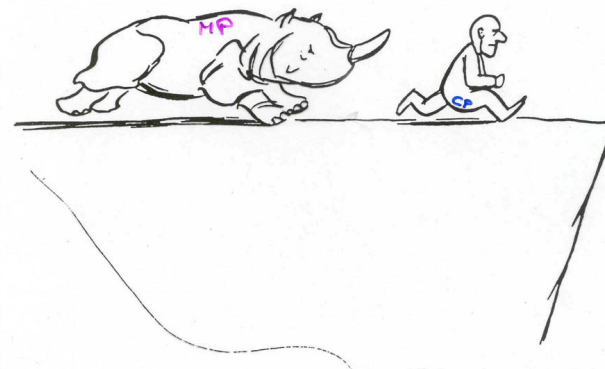
Mars Production



quite stuck in the beginning

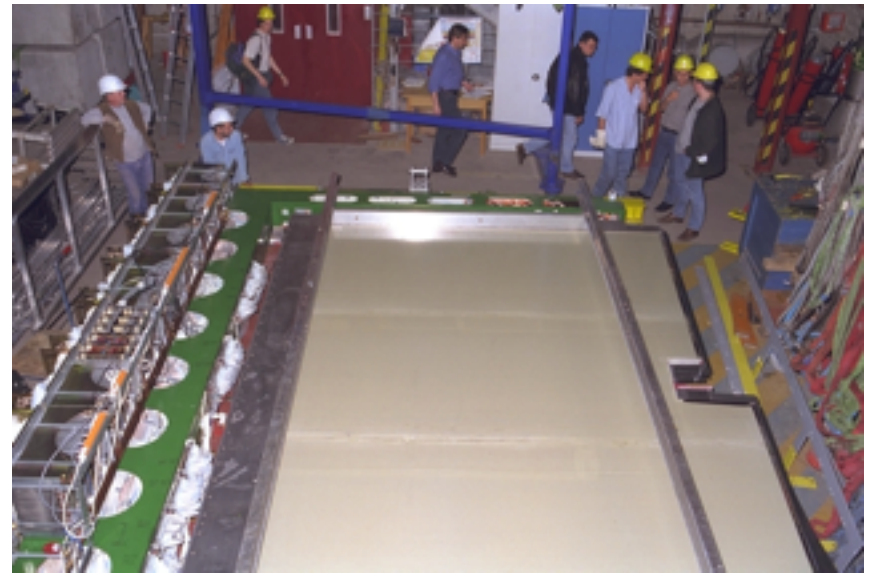


was brought into full swing...



by young, highly gifted Spanish post-docs

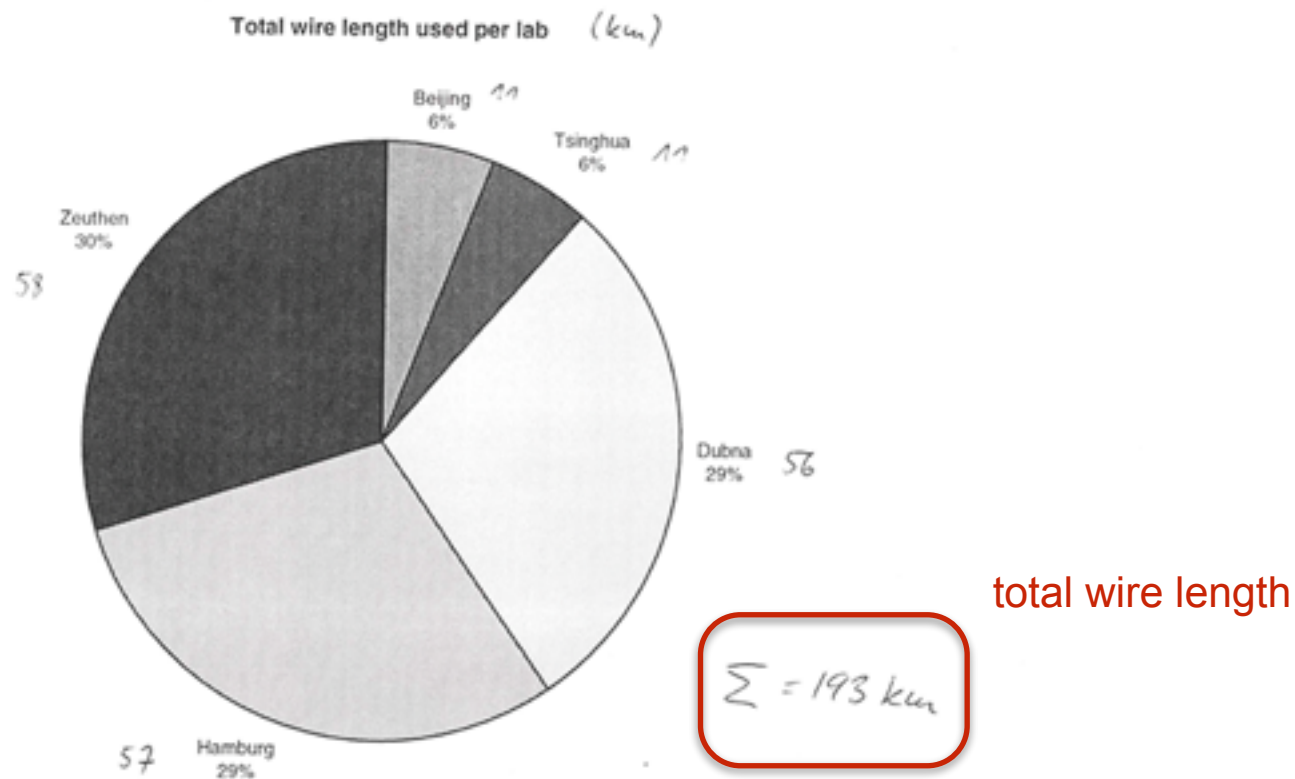
OTR mass production



..end of production party...



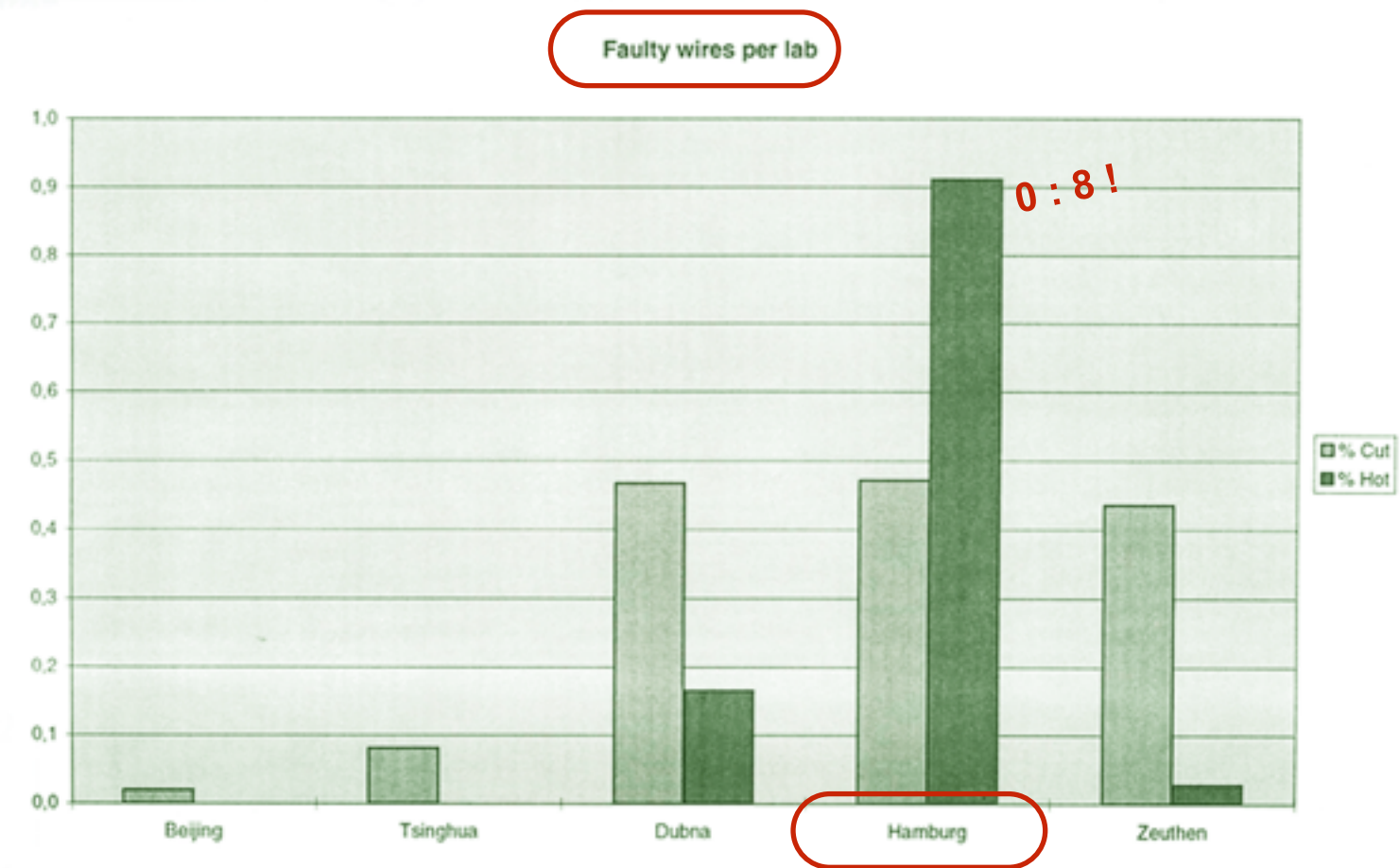
finally completed



FPLAB.XLS

03.11.1999

finally completed



H.Kapitzo

FPLAB.XLS

03.11.1999

The “public crisis” (1999)

DER SPIEGEL 44 / 1999

DEBATTE Sperrt das Desy zu!

Der Teilchenbeschleuniger Desy bei Hamburg, der jedes Jahr 250 Millionen Mark verschlingt, liefert nur irrelevante und langweilige Ergebnisse – ein Musterbeispiel dafür, wie die moderne Physik den Laien für dumm verkauft. Von Hans Graßmann

Shut down DESY !

Wenn man wenigstens auf die Zukunft hoffen dürfte, das geht ja fast immer. Hier nicht. Für die Zukunft hat das Desy das „Hera-B“-Experiment organisiert: mit cir-

no hope fore the future : it's HERA-B !

233

Wissenschaft

ca 300 Physikern (Techniker nicht mitgezählt), und mit wie viel Geld, will ich lieber nicht wissen. Es ist das weltweit erste und einzige Experiment, das schon gescheitert ist, ehe es in Betrieb geht. Die Idee für Hera-B war folgende: Früher

HERA-B :

world's first and only experiment which failed before it started

the race was over... and HERA shutdown ahead

October 2000 :

PRC Recommendation:

- **finish HERA-B** because of:
 - **still unsolved problems**
 - **not competitive with BaBar and Belle**

Recommendation of DESY Directorate (cont'd):

Today, it is apparent that the accelerator developments in Japan and the U.S. have progressed impressively fast. The solution of the technological challenges of HERA-B however was delayed by several unexpected fundamental problems, which required major technological changes. Thus the completion of the detector has been delayed by two years and is not yet finished. It is to be expected that the complete commissioning of HERA-B will take one or two more years, and that the original physics programme will thus most likely not be competitive.

All in all, the HERA-B collaboration has succeeded in constructing and commissioning a very sophisticated and powerful spectrometer which can stand the extremely high particle fluxes. Particularly noteworthy are the wire target, the silicon vertex detector for tracking very short-lived particles, the gas chambers for highest particle densities, an extremely well-working detector for particle identification (RICH Cherenkov detector), a counter for detecting electrons and photons (electromagnetic calorimeter), and the trigger and data acquisition systems.

**Recommendation of
DESY Directorate:**
limited data taking after HERA
shutdown



what to do in shutdown time ? The HERA-B song contest

Interaction by The Falling Stones

(Melody: Rolling Stones, "Satisfaction"

Text : Herbert Kapitza)

Refrain:

We don't get no interaction, we don't get no interaction.
It's shutdown, it's shutdown, it's shutdown, it's shutdown.
We don't get no, we don't get no.

Have you heard of HERA-B?
Well, the whole thing started years ago.
The problems got more and more,
requiring tough investigation
to measure CP violation.

We don't get no, oh no no no. Hey hey hey: Hey Golden Decay!
[Refrain]



more falling stones

concrete slab crashed into Hall West



2001 : hard decisions ahead

the “Schmelling formula” or “M -T product”:

It is obvious that we all want HERA-B to be a success. My question is whether we have the manpower/ressources to achieve this. We need a quantitative assessment of the amount of work W ahead of us, the manpower M that is available to do the job and the time T until we want to achieve our goal. In case we conclude $M \cdot T < W$, then the only sensible solution is to stop. For $M \cdot T \geq W$ we can decide, whether the goals are worth the effort.

The factors M, T and W are certainly known to our management. After all, its their job to keep track of these quantities. I thus would like to ask them to provide these inputs for the various scenarios: physics goals, task lists, available manpower and time schedules. These inputs must be open, available to everyone. In the discussion we then can determine whether we agree with those numbers, maybe suggest revised estimated, and given agreed-upon inputs, work towards a consensus with respect to the future of HERA-B.

best regards,
Michael

Michael Schmelling | MPI fuer Kernphysik
Phone: +49-6221-516-511 Fax: +49-6221-516-603 | Postfach 103980
Email: Michael.Schmelling@mpi-hd.mpg.de | D-69029 Heidelberg

M : man power
T : time
W: work

brilliant!

$M \cdot T < W ?$

$M \cdot T > W ?$



running after the shutdown : fighting the man power drain...



in constant struggle with the gods...

(CB, Jan. 2003)

Status of Luminosity & Background problems

Intimately nested !



HERMES & HERA-B
asking for beam



.. WE HAVE TO USE WHAT WE STILL GET..

Online log book

[read me](#) [view latest](#) [view previous](#) [view next](#) [view specific](#)
[view log only](#) [clarify](#) [view clarifies](#)

-- not latest file, writes disabled. 'view latest' to enable writes

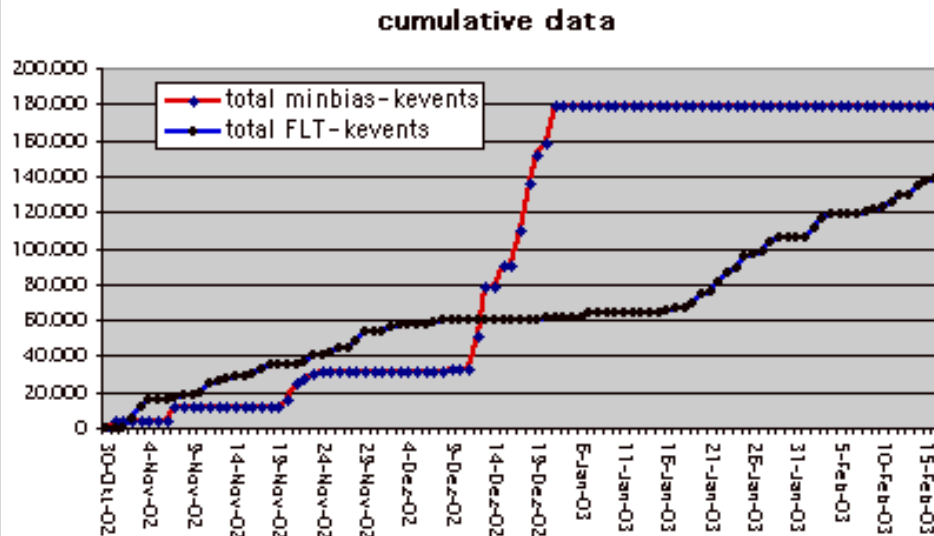
slog_02_06_02-01

time	entry
	Run team: Bugs Bunny, Shift crew: Romeo(leader), Juliet
	Current status: sunny and quiet
02/06/02 15:22	Plan Have a good time
02/06/02 15:23	Comment from J What a lovely day.
02/06/02 15:25	Comment from R It just started raining
02/06/02 15:25	Comment from BB What's up doc?
	Shift summary
	Accomplishments: nobel prize
02/06/02 15:26	Problem summary zillions
	General observations: It feels great.

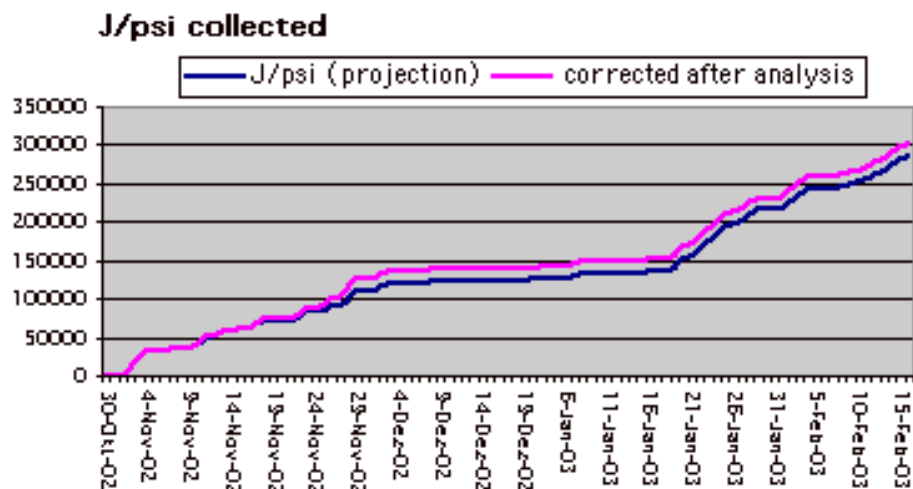
first page of online-log

.. J, R and BB ready for anything ...

... till February 15th, 2003



180 million min. bias
140 “ 1st level
trigger events



300 k J/Psi events



March 3, 2003 : the loudest party ever (at DESY)



Monday, March 3, Kantinenanbau, > 19 hours

don't miss

HERA-B: THE PARTY

[click here to book : drinks & food = 15 Euro
- the music is free -](#)

MUSIC & SHOWS

"Black Dog" -
the Led Zeppelin revival band

"ReAL RoAD"
real blues-real rock-real groove

party ...



party -2



the founding fathers..



and the glamorous girls



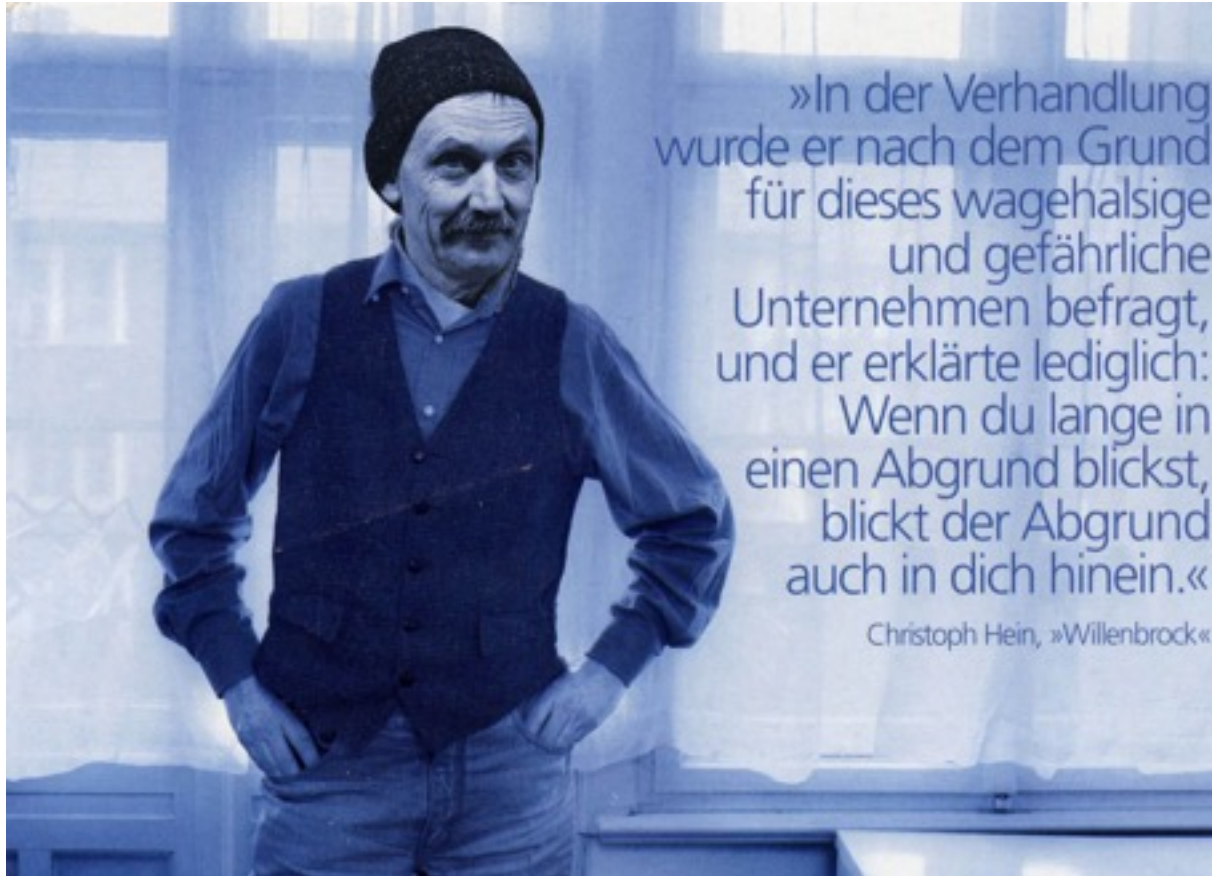
and boys ..



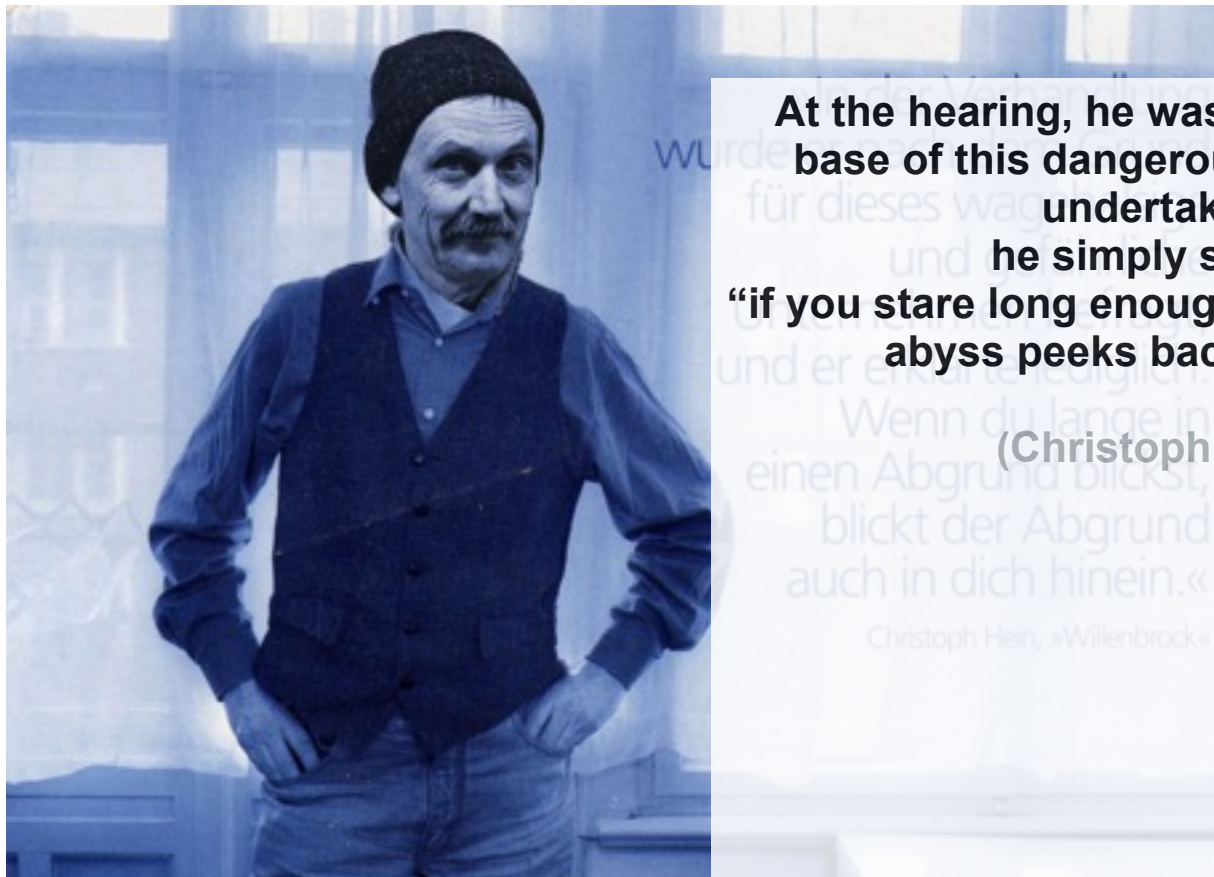
some never give up..



the missing man...



the missing man...



**At the hearing, he was asked about the base of this dangerous and daredevil undertaking, he simply stated :
“if you stare long enough into an abyss, the abyss peeks back into you”.**

(Christoph Heyn)

Christoph Heyn, »Willenbrock«

what was HERA-B ?

- a courageous idea ?

- a mad enterprise ?

- a pioneering experiment ?

- an infinite money pit ?

- a complete disaster ?

for sure : an experience of life 😊

