The first Ideas for Hera-B

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HERA-B motivation : Try to continue ARGUS

ARGUS, the e^+e^- experiment at DORIS, was big fun. But

1992 DORIS degraded after changes for Sync. Rad.

ARGUS proposal : HELENA a Beauty factory at Hamburg, using PETRA .

Voss : Luminosity for e^+e^- B-factories impossible to reach.

Wiik : B-factory does not guarantee survival of DESY.

Sörgel : Interested, but decision delayed

After approval of BaBar and Belle no room for HELENA

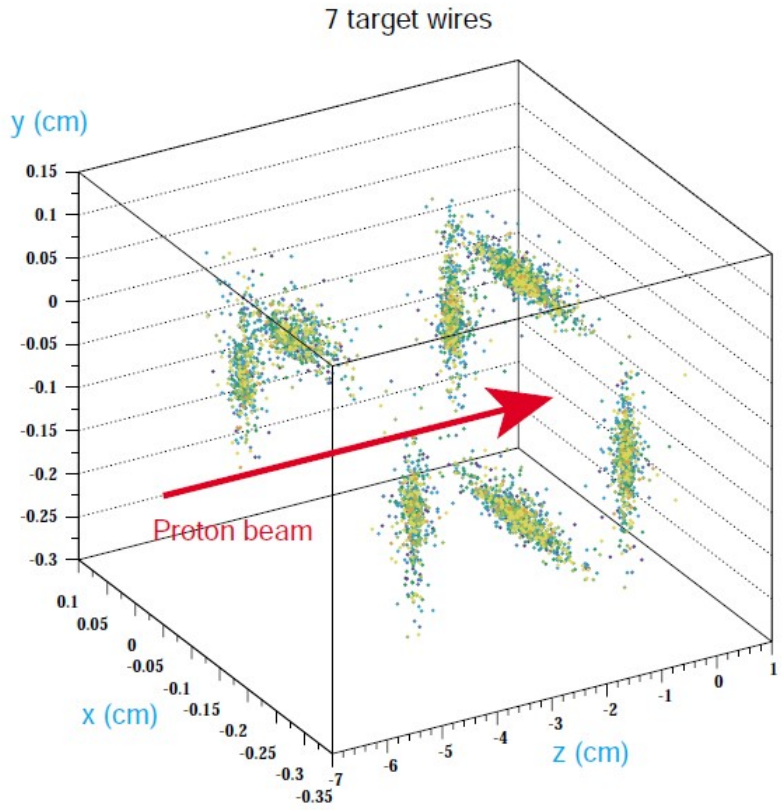
Sörgel : Two Options for ARGUS

1. Join BaBar get 30 MDM (BaBar already overcrowded)
2. Go to HERA (one interaction region still free)

Try the Option : Go to HERA

The basic idea :
Measure CP-violation of B-mesons by
producing the B-mesons with a wire target
In the halo of the HERA p-beam

First tests : Wire target worked well
allows for high event rate



b-quark pair rate

$$\dot{n}_{b\bar{b}} = A\,\frac{\sigma_{b\bar{b}}}{\sigma_{inel}}\,\dot{N} = 63.6\,\frac{12\,\mathrm{nb}}{782\,\mathrm{mb}}\,40\,\mathrm{MHz} = 37\,\mathrm{Hz}$$

(Cu target, assumed $\sigma_{b\bar{b}} = 12\,\mathrm{nb}$, 4 superimposed interactions)

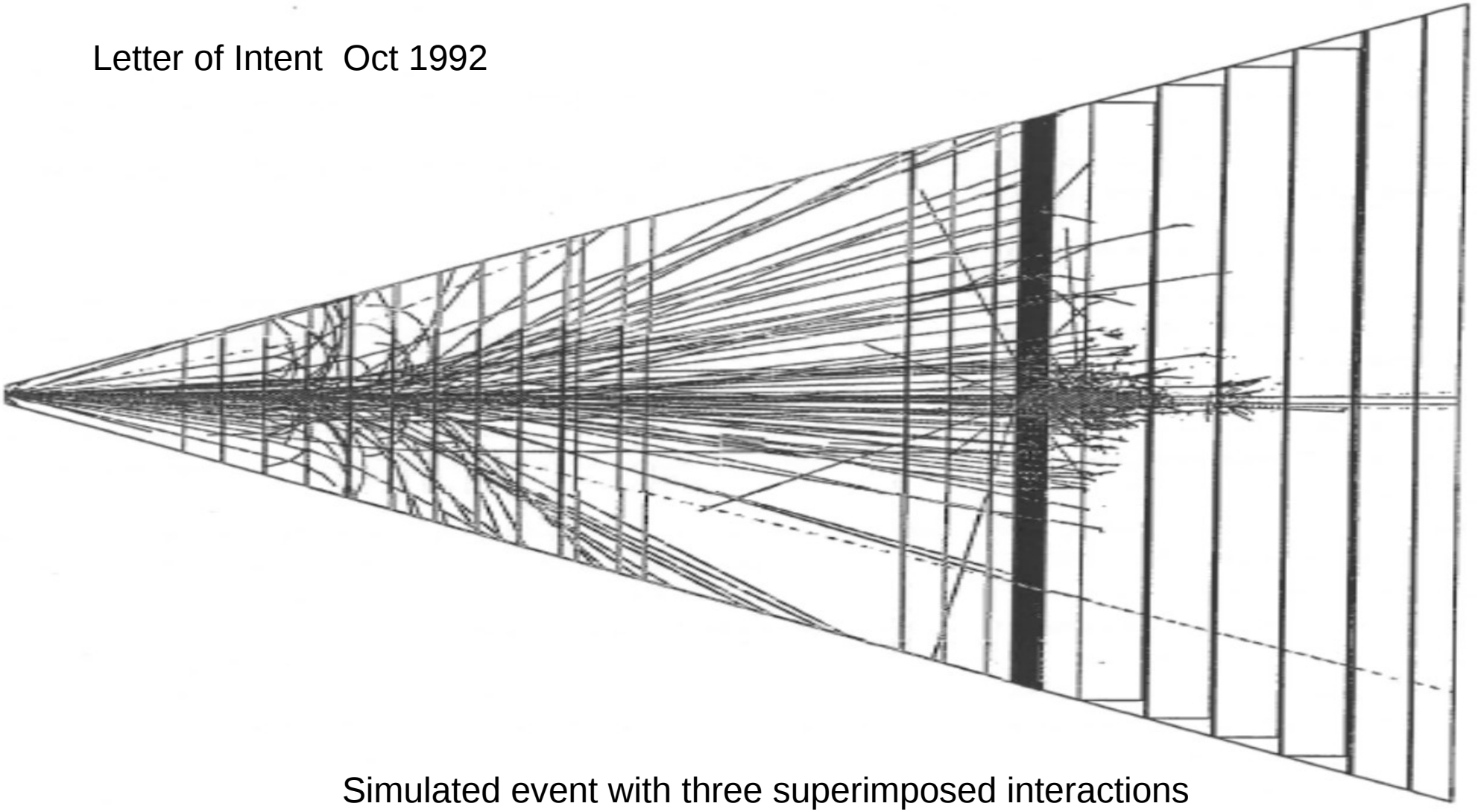
Enough for a measurement of CP-violation, however,

$$\frac{\dot{n}_{b\bar{b}}}{\dot{N}} = 10^{-6} \qquad \text{and} \qquad \frac{\dot{n}_{B\to J/\psi\,K^0_s}}{\dot{N}} = 10^{-11}$$

Needle in a haystack (same situation as at LHC)

The challenge

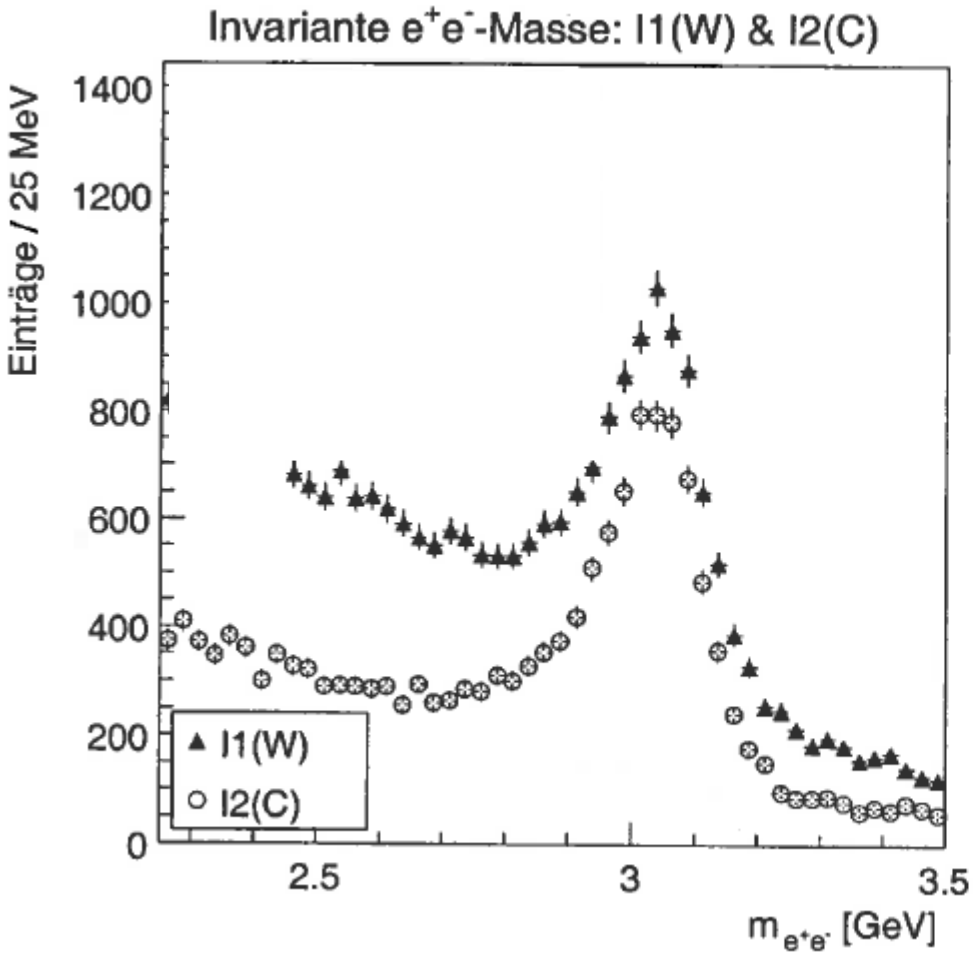
Letter of Intent Oct 1992

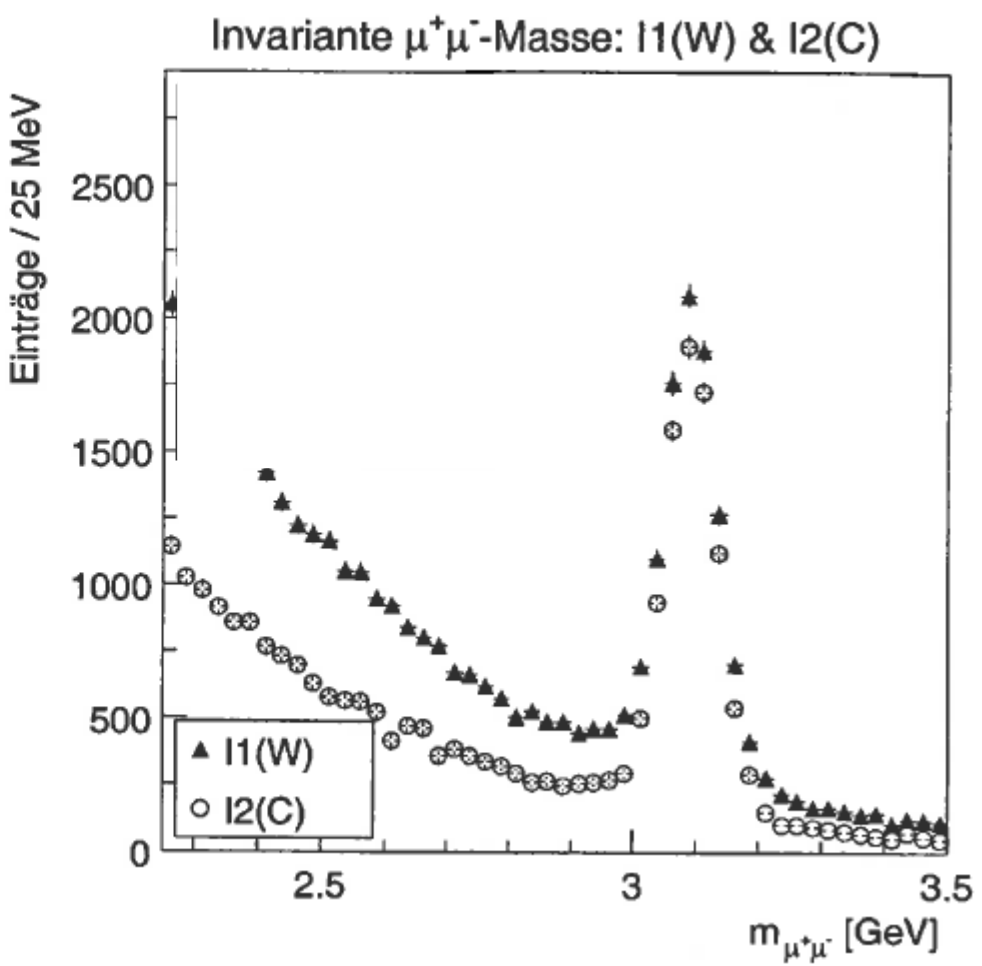


Simulated event with three superimposed interactions

Every 96 ns

Golden channel J/ψ K_s^0



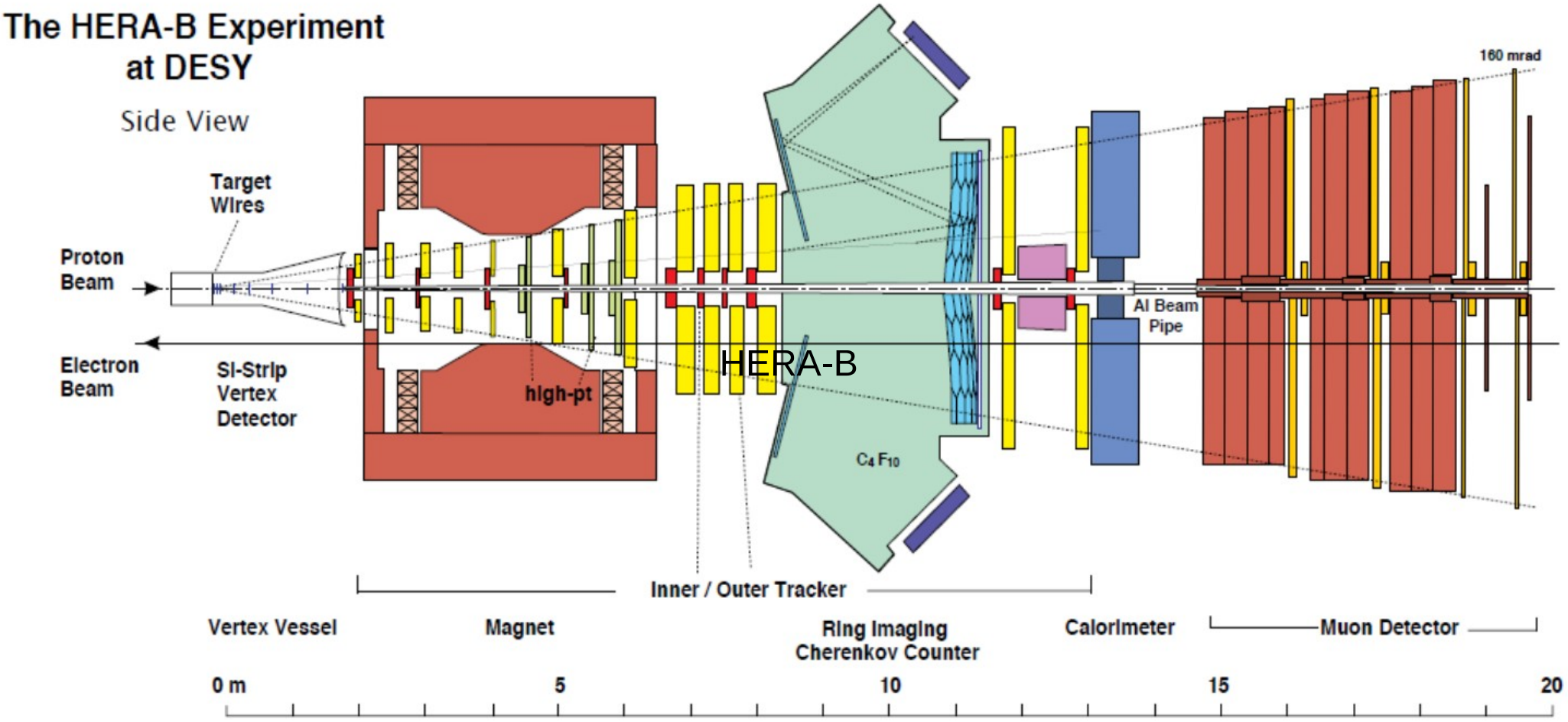


J/ψ sticking out of the haystack (Pernack)

Build a J/ψ trigger

Detector design

HERA-B, tentative name, but no better name was found



Detector at or beyond the limit of technical possibilities.

Bad news : FNAL E 678 σ_{bb} = 6 nb

(assumed 12 nb, HERA-B measured 15.8 nb)

WSP : Give up

- Too difficult

W. Hofmann : Don't give up

- Perhaps e^+e^- fails getting high luminosity.
- HERA-B : The only new european HEP project for many years, where it is possible to contribute hardware.

(CERN : LEP finishing, LHC far away. DESY : HERA ep ready)

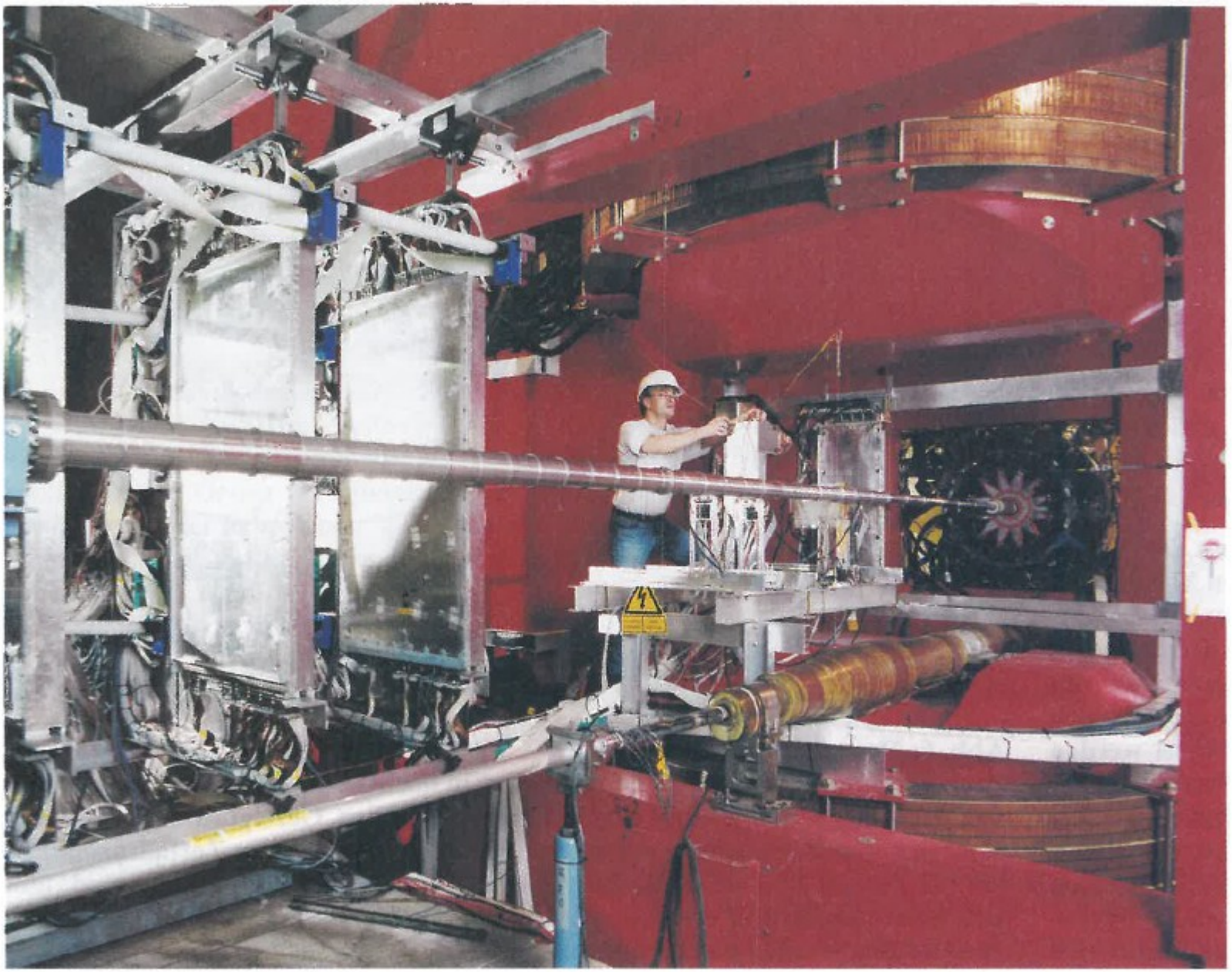
→ Did not pull the emergency break

Proposal May 1994, Technical design report Jan 1995, Approval Feb 1995

Unpleasant race for the first measurement of an imaginary part in the CKM matrix

Distribution of work

Had to take the magnet

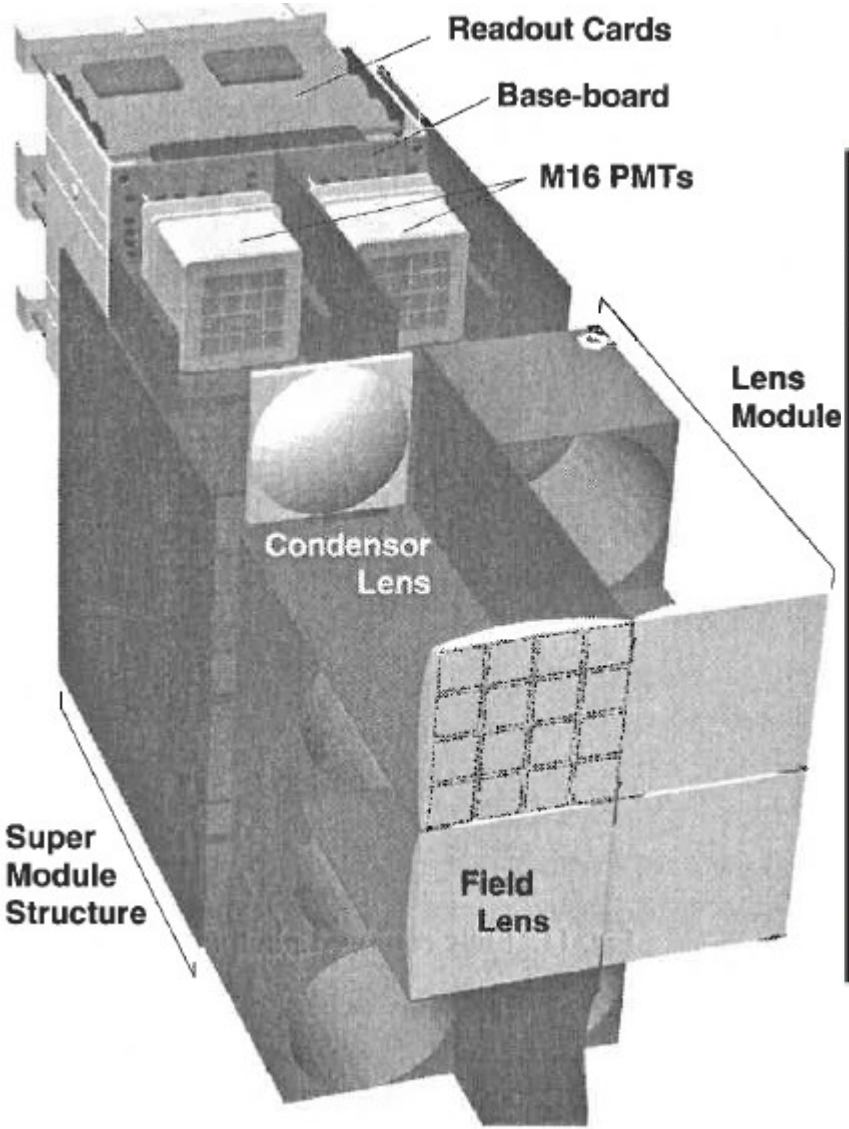


Shielding of the Hera e-beam highly nontrivial (R. Eckmann)

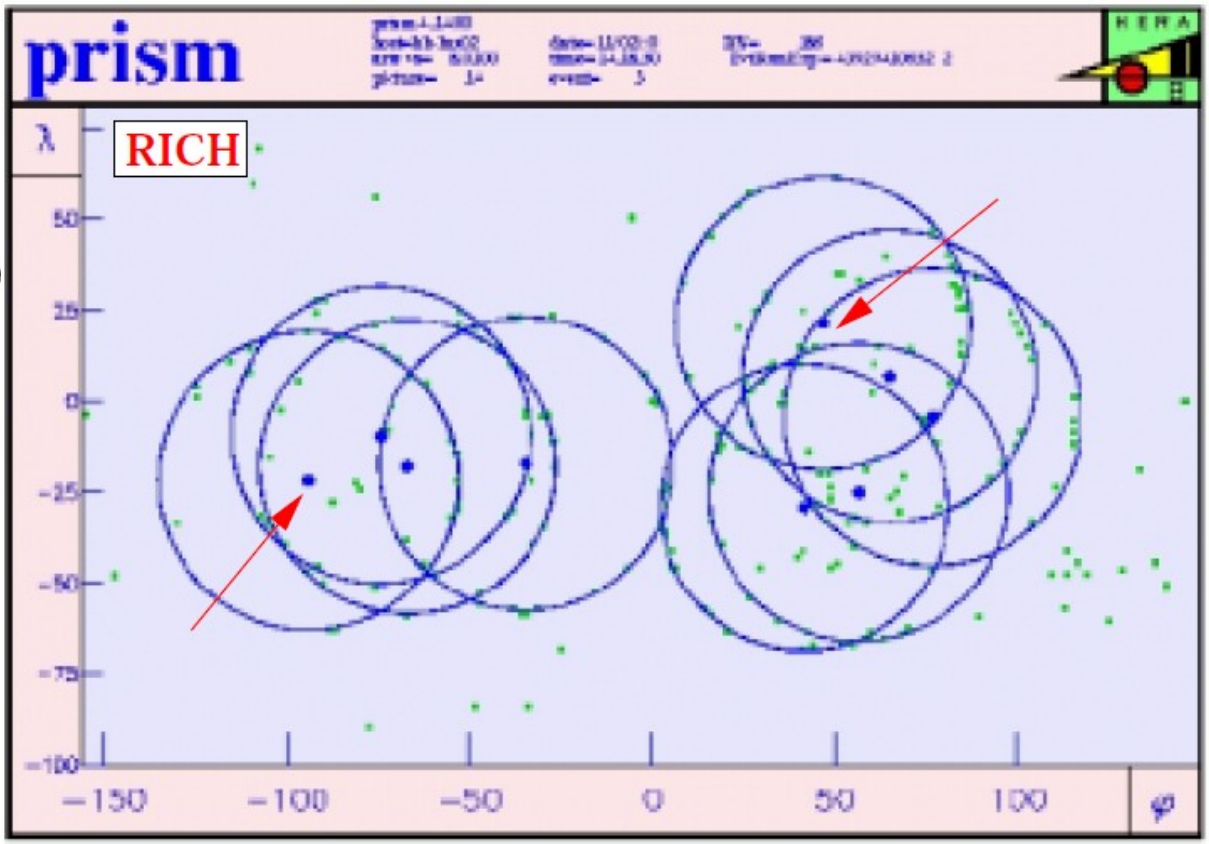
RICH

Photon Detection : Cs I or TMAE proposed

Cs I : fast ageing
TMAE : ageing measurements in the US surprisingly good, did not believe,
repeated at DESY : Very fast ageing. Had to convince the Americans.
PMT : demagnification required (R. Schwitters)



Excellent RICH



Crisis 1999 (Babar and Belle start)

M. Medinnis 1999 : Many pieces of excellent hardware and software ready

Present status

System	%[a]	Status
Vertex	100	okay
Inner Tkr	50	tight schedule
Outer Tkr	50	okay
RICH	100	okay
TRD[b]	100	okay
ECAL[b]	100	okay
Muon	95	okay
DAQ	100	okay
1 Lvl Trig	25	critical path
2/3 Lvl Trig	60	okay
4 Lvl Trig	10	okay
Recon SW	100	okay

[a] % in hand

[b] readout incomplete

HERA-B is an adventure

Several unpleasant surprises →

Race for the Nobel-Prize

Winners : Kobayashi, Maskawa, 2008

Fast : BaBar and Belle, 2002

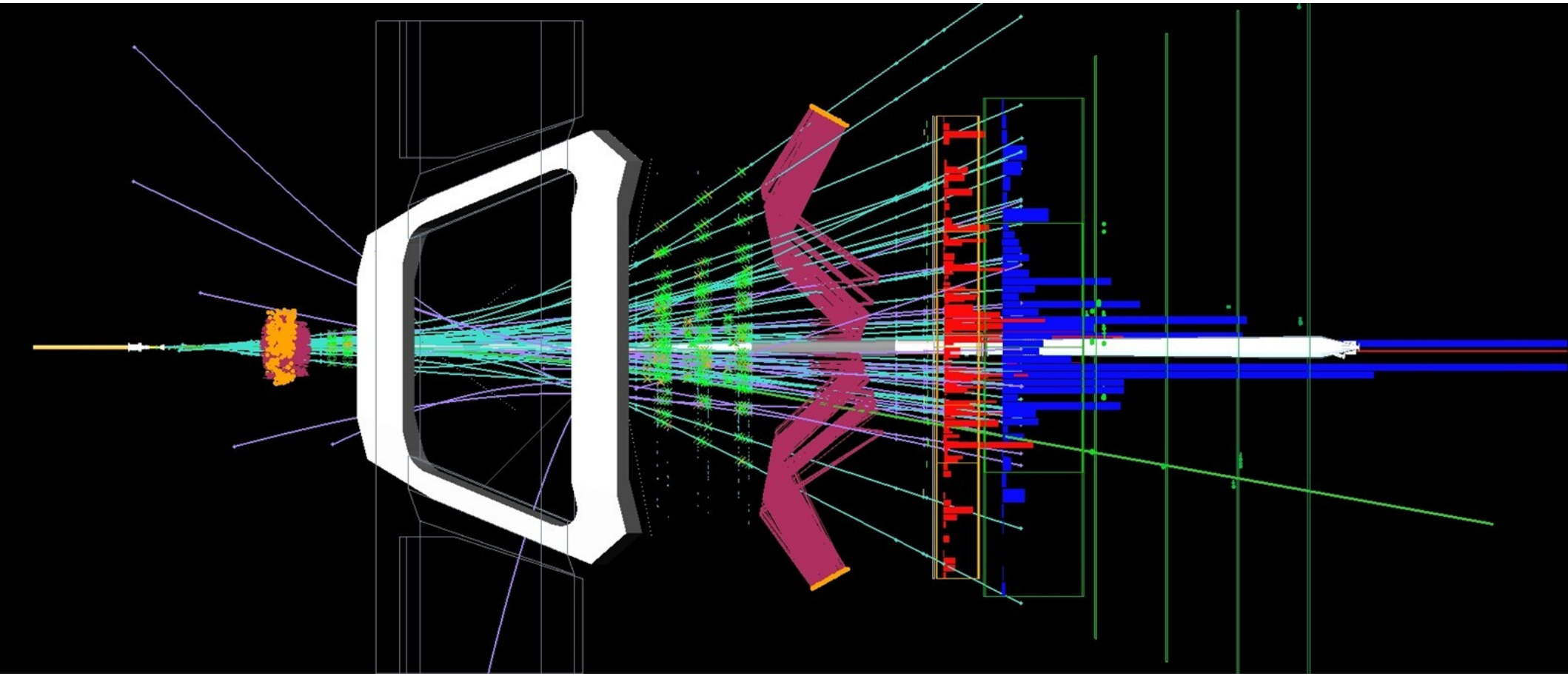
Delayed : HERA-B

Anyway the Nobel-Price was given to the theorists and not to the experimentalists.

LHC-b

From HERA-B many people went to LHC-b. Transfer of expertise.

Similar name, similar detector, similar rates, now adequate technologies available



HERA-B provided over 10 years for a generation of students an excellent playground for getting expertise in many innovative technologies.

Basis for further careers.

Good reason to celebrate.

HERA-B