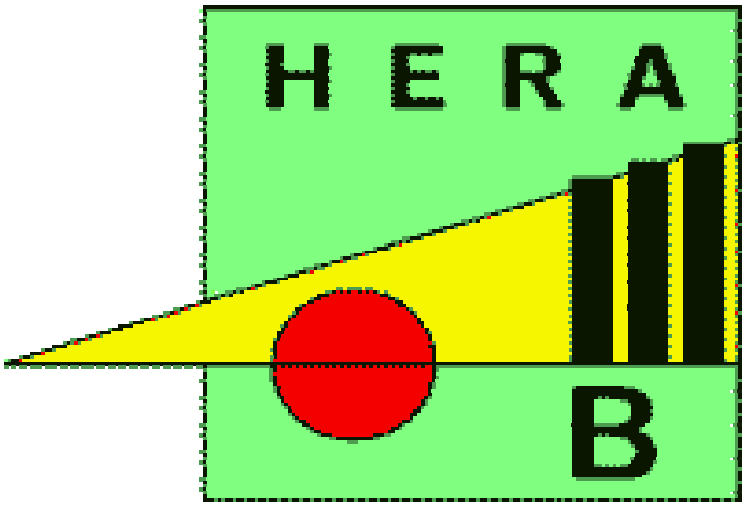
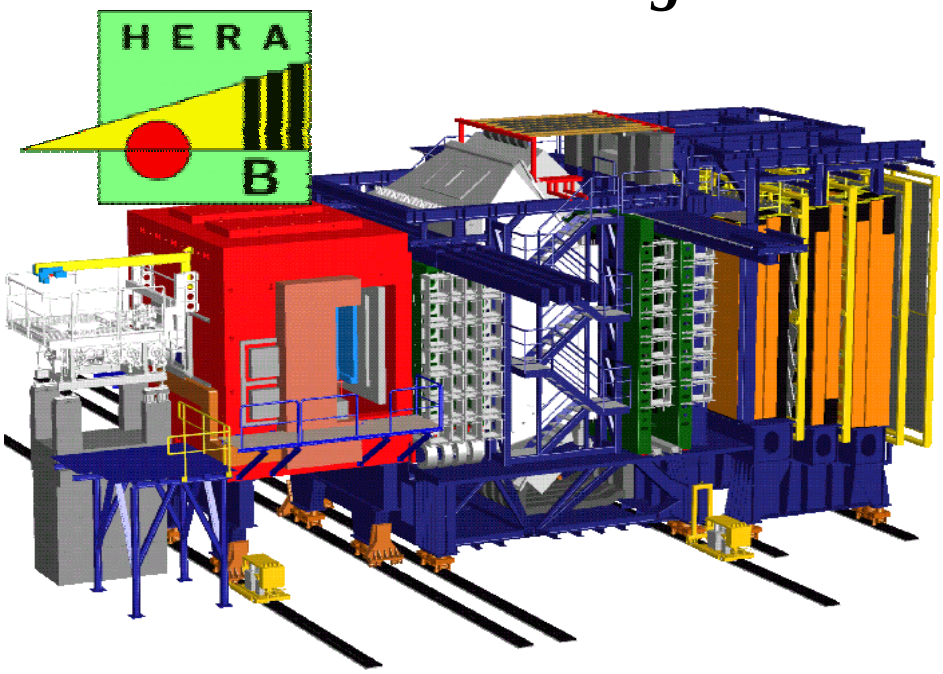



# Status and Prospects

Bernhard Schmidt
DESY

## *Fixed target hadronic b-factory*



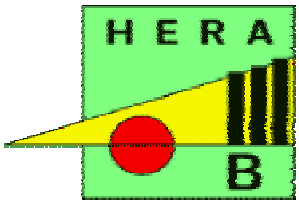

**Design**

- 920 GeV protons on wire target
- $4 \cdot 10^7$ interactions/s (~5ev/bx)
- highly selective di-lepton trigger (J/ψ trigger)

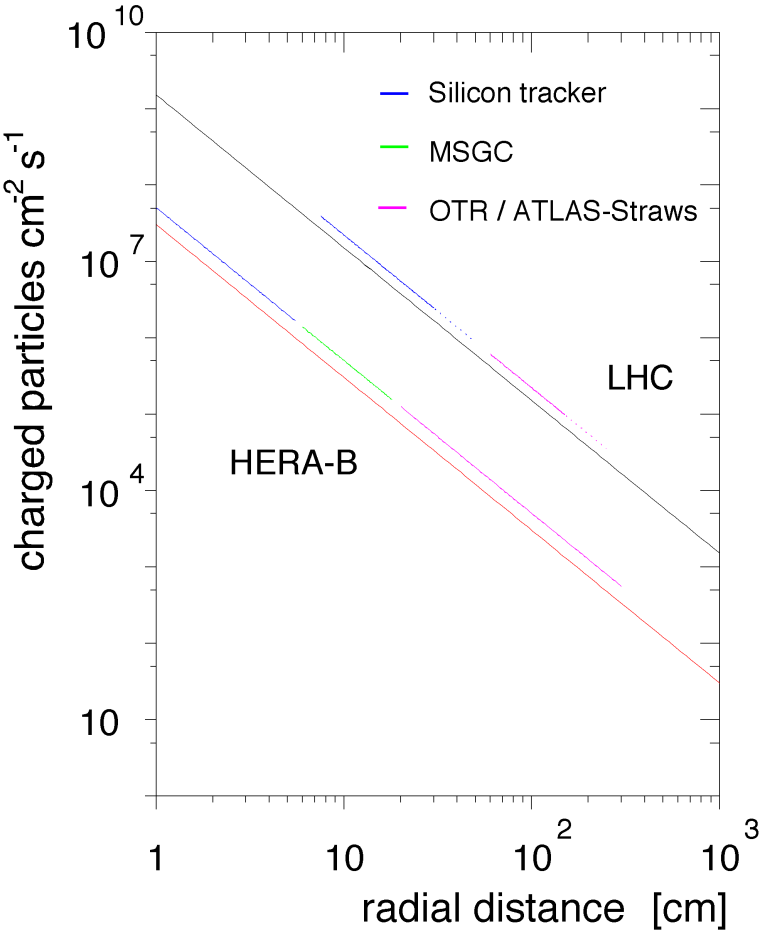
**200 000 direct J/ψ / hour**

**100 B→ J/ψ X /hour**

proposed in 1994
finally completed spring 2000
now in commissioning phase




# has to face LHC equivalent particle flux. NOW.

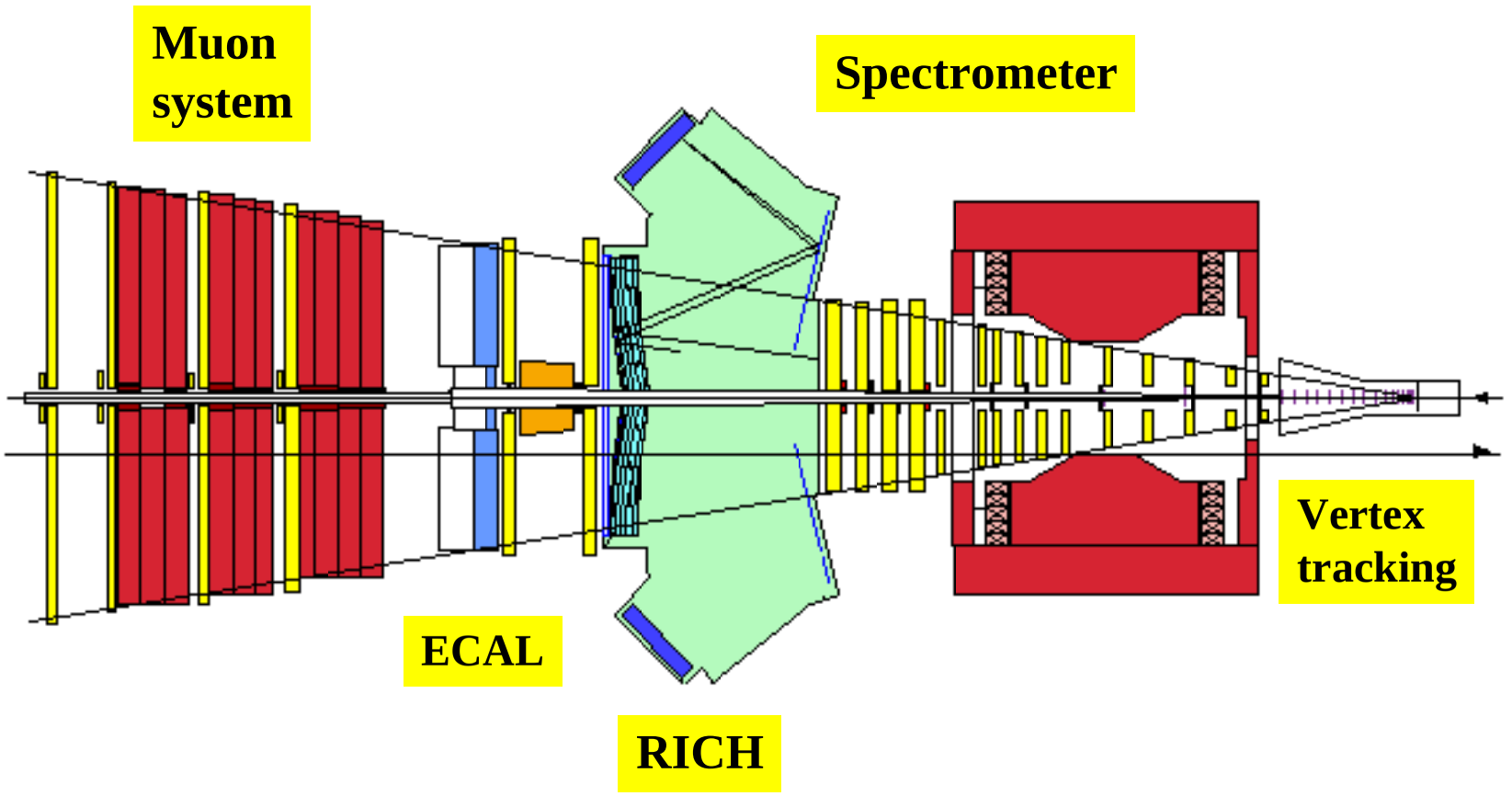



exploring a new regime of radiation load, particle flux, event rates...

detectors
trigger system
DAQ

} at forefront of technology

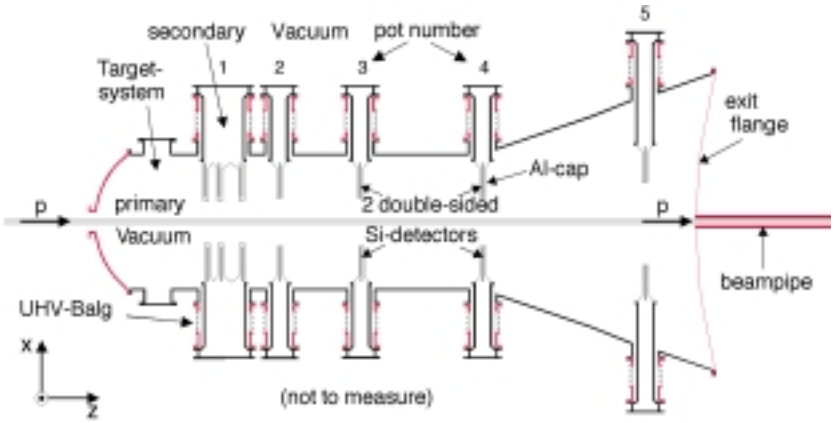
# *Forward spectrometer*



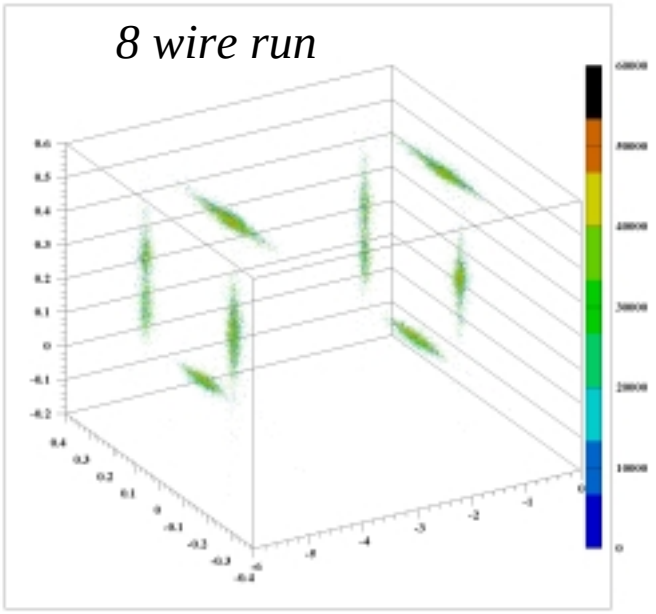

$10 < \theta < 200$ mrad

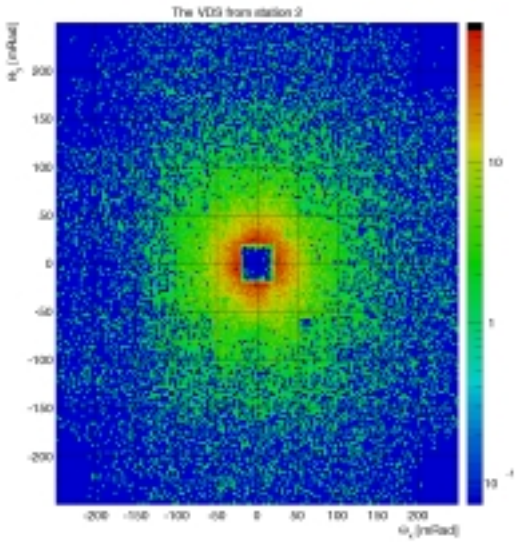
# *Vertex Detector System*

Vacuum Tank with Roman Pot System




8 superlayers
64 silicon detectors
150 000 channels



covers 15 -200 mrad
(at present)

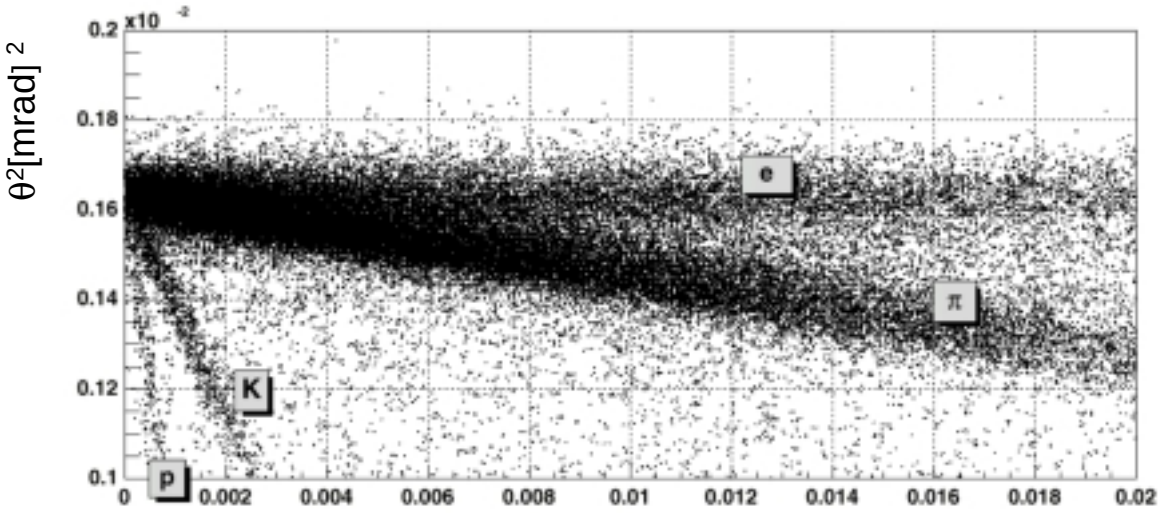
$\sigma_{x,y} \approx 60\ \mu m$
$\sigma_z \approx 500\ \mu m$

$\beta\gamma c\tau \sim 8$ mm

Performance
close to design specs

# R•I•C•H

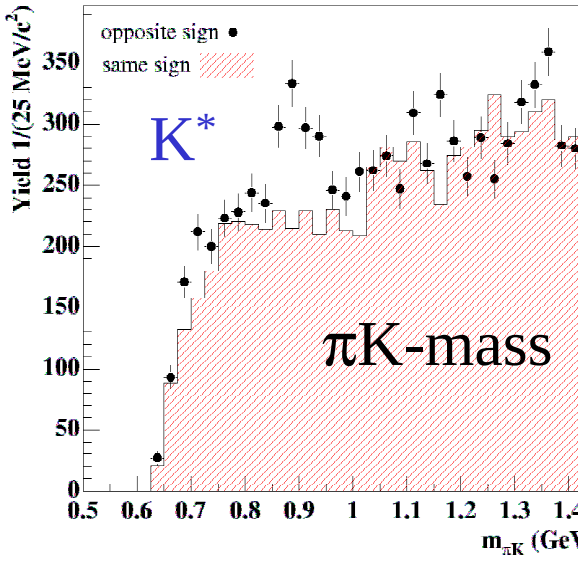
Cherenkov Relation for $\theta_{\beta=1} << 1$: $\theta^2 \approx \theta^2_{\beta=1} + \frac{m^2}{p^2}$

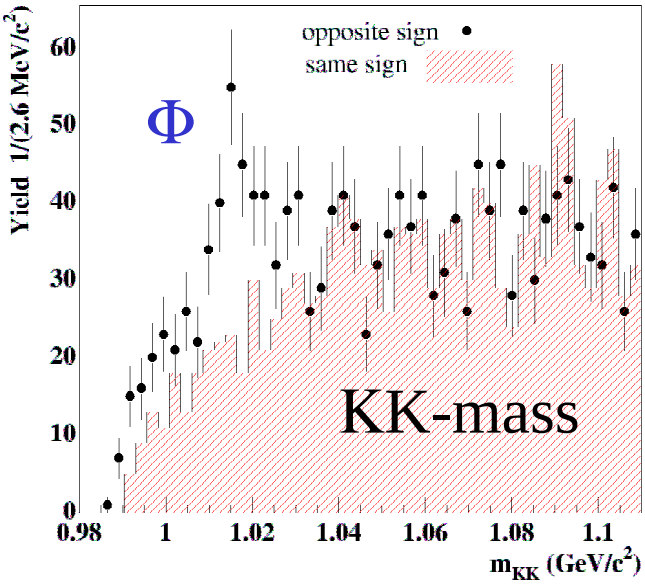


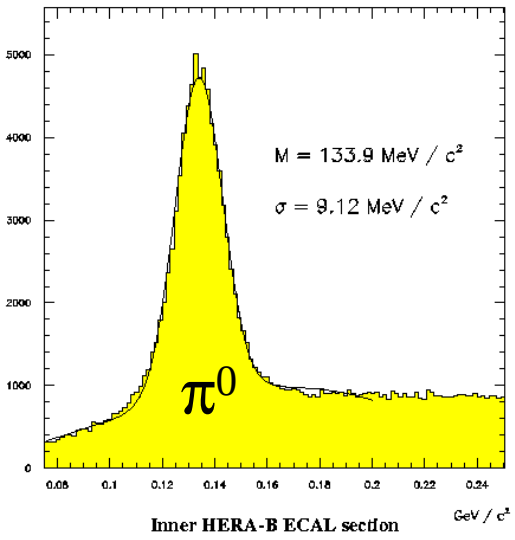

*Particle Separation*

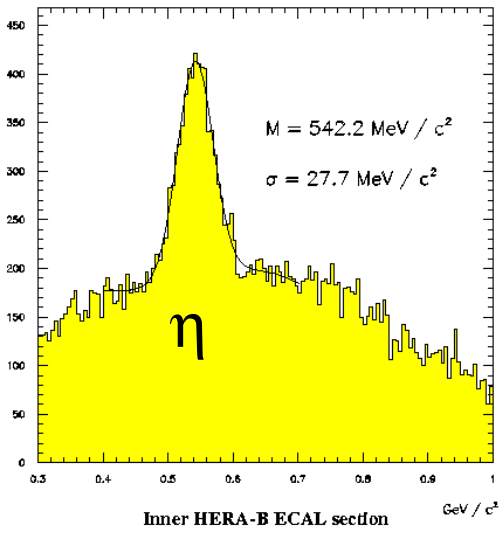
| | Current | ultimate |
|---|---|---|
| e–π | 3.4-15 GeV/c | 3.1-19 GeV/c |
| π–K | 12-54 GeV/c | 11-64 GeV/c |
| K-p | 23-85 GeV/c | 21-95 GeV/c |

Close to design.



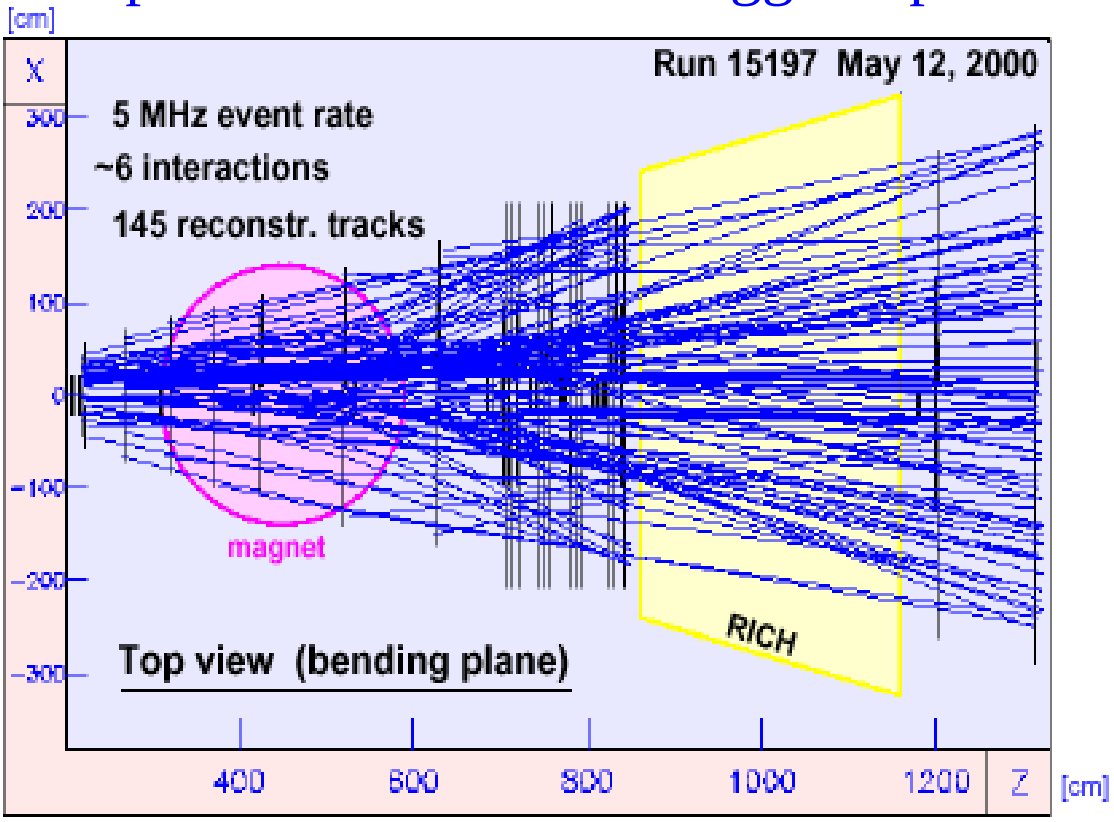




largely completed
minor problems with
stability, hot channels..

- main source
for **lepton**
**pre-triggers**
up to now

## *Tracking detectors* (see talk by R. Eckmann, PA12)

### - spectrometer & track trigger input




## Inner Tracker

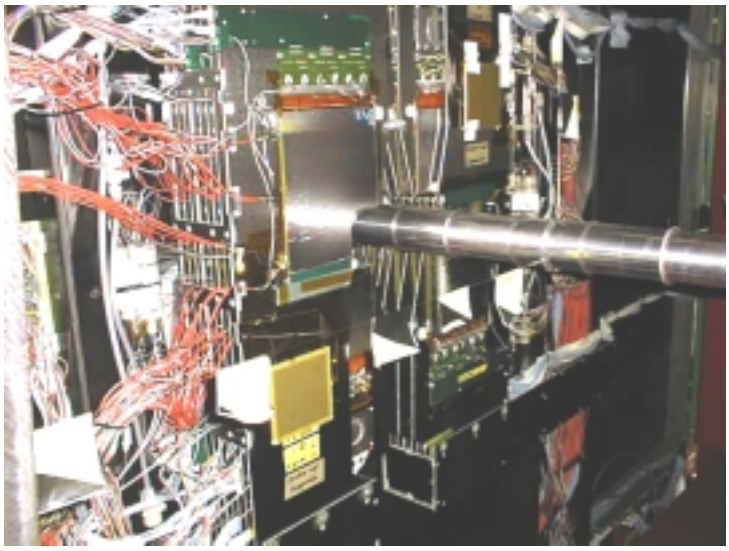
MSGC + GEM detectors 10 - 23 mrad

## Outer Tracker

Honeycomb drift tubes 20 - 200 mrad

## I•T•R

***Completed after 6 years of continuous struggle and intense R&D***



- 34 layers GEM-MSGC (136 chambers)
- 104 000 channels (ADC)

World‘s largest Micro Pattern Detector frontier technology

Performance:

± stable operation (so far), but HV settings close to limit
+ resolution at design value (~ 80 µm)

- efficiency still on low side (80 - 90 %)

- no contribution to trigger this year (electronics problems)
exchange electronics in long shutdown

# O•T•R

***Completed after solving several fatal problems***

Production and installation within 9 month

1000 honeycomb driftchamber modules, 120 000 channels

~ 1000 $m^2$ detector surface

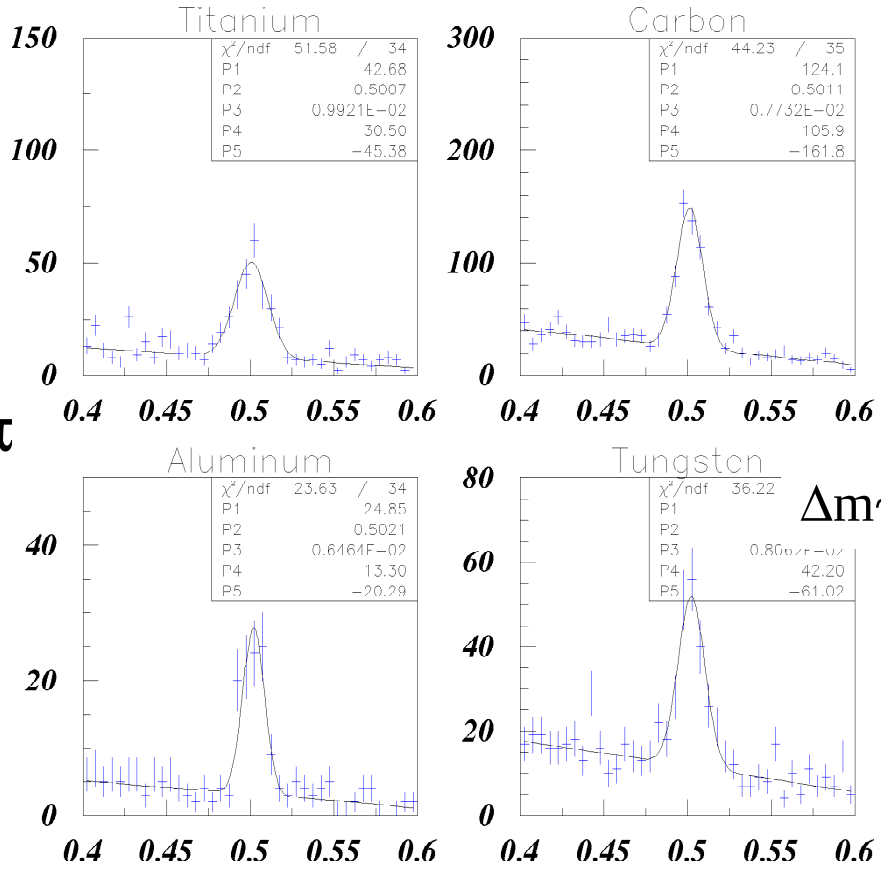
+ routinely operated as tracking device
+ alignment fairly advanced
- resolution ~ 500 µm (design 200 µm)
- efficiency ~ 90 % (design > 98 %)
- HV settings close to limit
- still loosing wires (~ 3-4 (0.03%) channels/day)
- ~ 15 % of channels unusable (at present)

Can be brought to ~2 %

infant problems ??

# *Reconstructed decays*

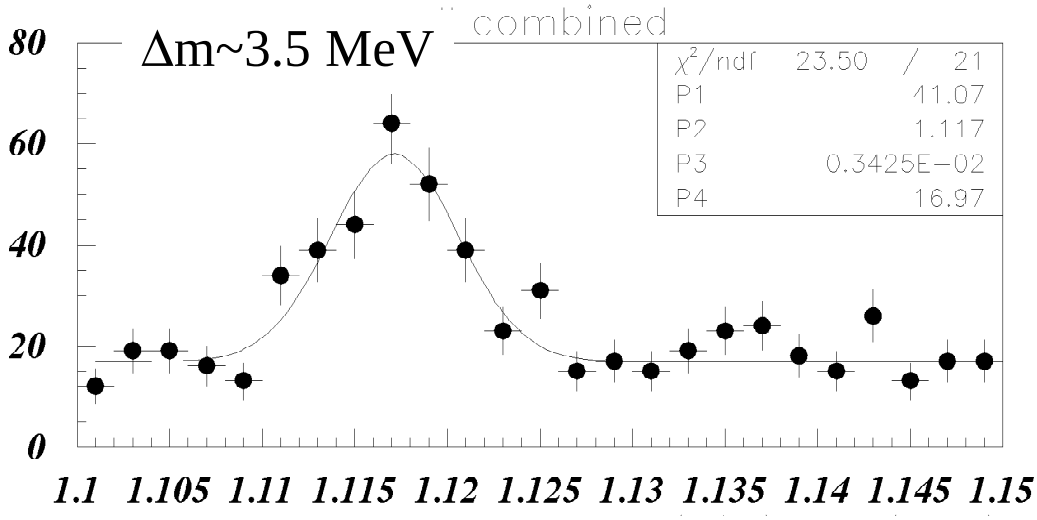
$K_s^0 \to \pi\pi$




Δm~8 MeV

mass resolution ~ MC

$\Lambda \to p\pi$



# Trigger System

*Pre-*

**e**
**μ**
(high-pt hadrons)

**10 MHz**

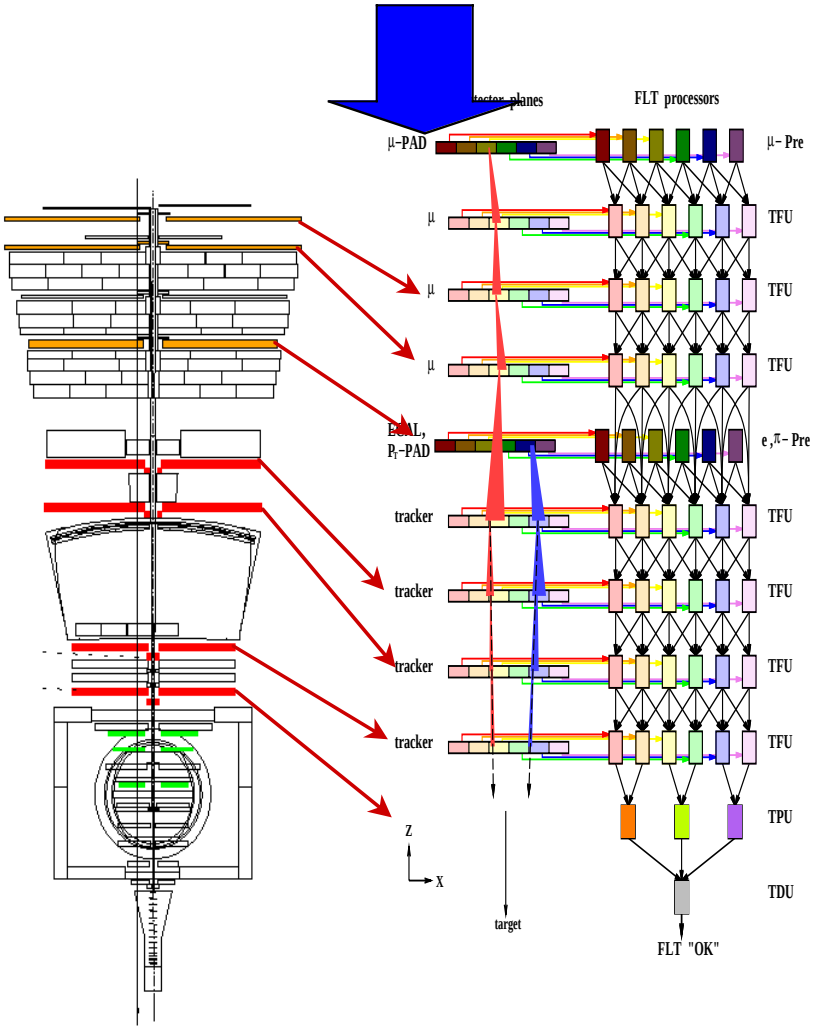
**FLT**

**50 kHz**

**SLT + higher**

**50 Hz**

*400 PC farm*
*no major problems*




Network (OTR and Muon) installed and operated

~ 60 custom made processors, 1200 optical links with 800 Mbit/sec each

# Trigger performance and status :

***Pretriggers*** :

e : routinely operated, reasonably stable

μ : first operation

pad efficiency still too low (~70%)

hadron high-pt : installation phase

***Track trigger*** :

\+ proof of principle established

\- still in commissioning phase

\- compromized by chamber inefficiency and link problems

***Remedies*** :

improve tracking detectors (clear limits visible)

mask out non-working channels / links (cutting rate capability)

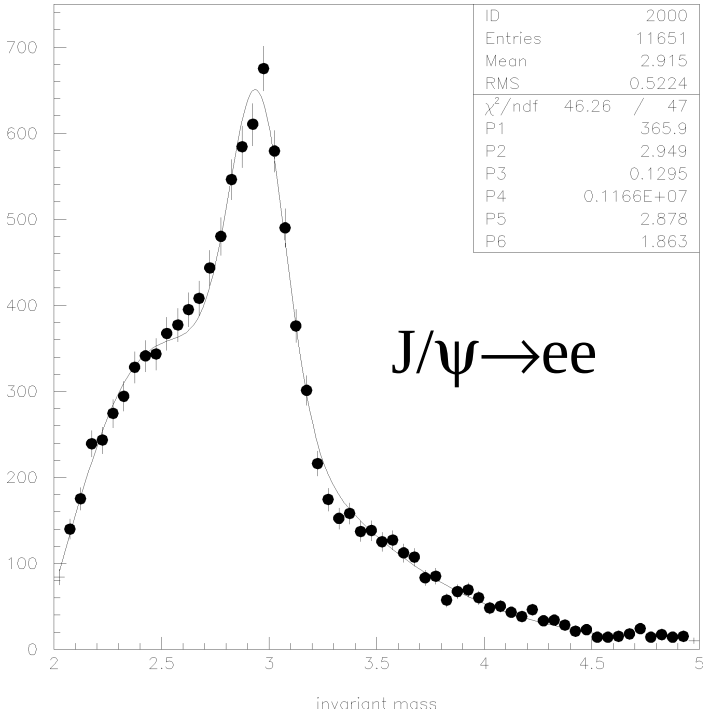
modify ‘trigger logic’ ?

# Nevertheless : HERA-B is triggering on J/ψ

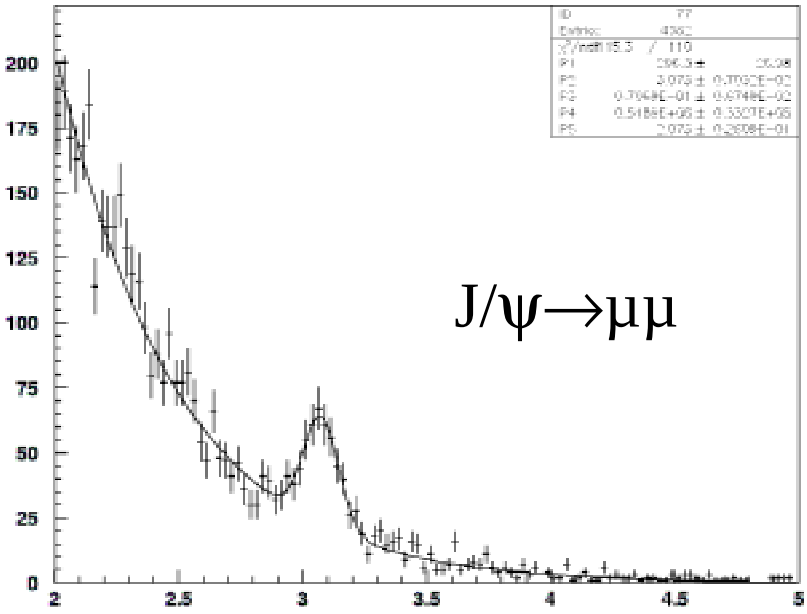
**(SLT only)**

**With electrons**:

$10^{12}$ interactions
$10^{9}$ events
analyzed online on
PC farm




**With muons:**



## *Conclusions and Outlook*

- The HERA-B detector has been completed in all its essential components and is in its commissioning phase.

-For this year (run end in 5 weeks) not more than 1% of the design $B \rightarrow J/\psi X$ rate can be achieved.

- Considerable efforts will have to be spent during the long shutdown to bring the $B \rightarrow J/\psi X$ rate to the order of magnitude of the design value by the end of 2001.

- Other and additional trigger schemes might play a fundamental role for the future prospects of the experiment.