43^{rd} PRC Meeting
July 24^{th}, 1997
DESY (Hamburg)

HERA-B STATUS REPORT

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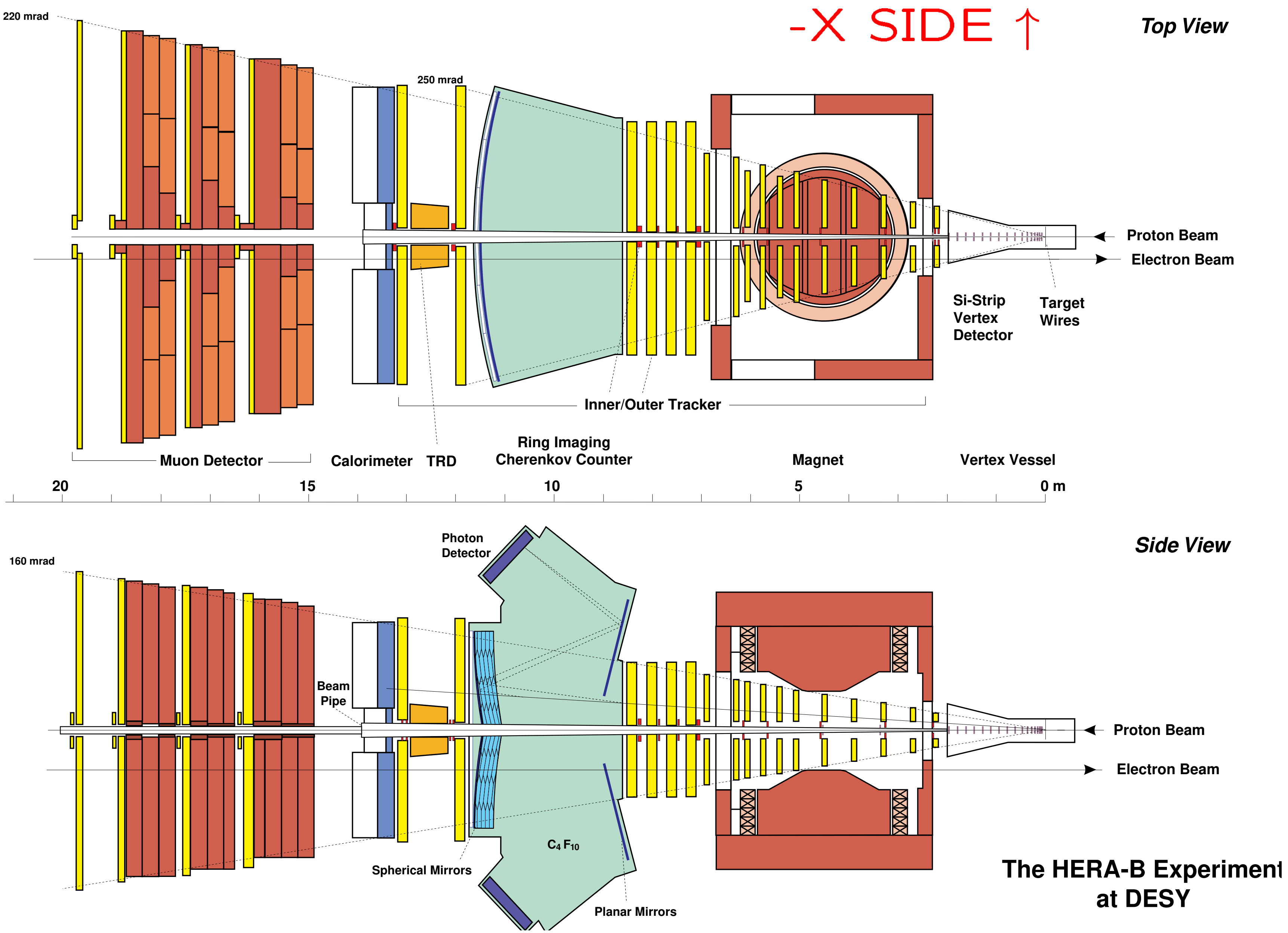
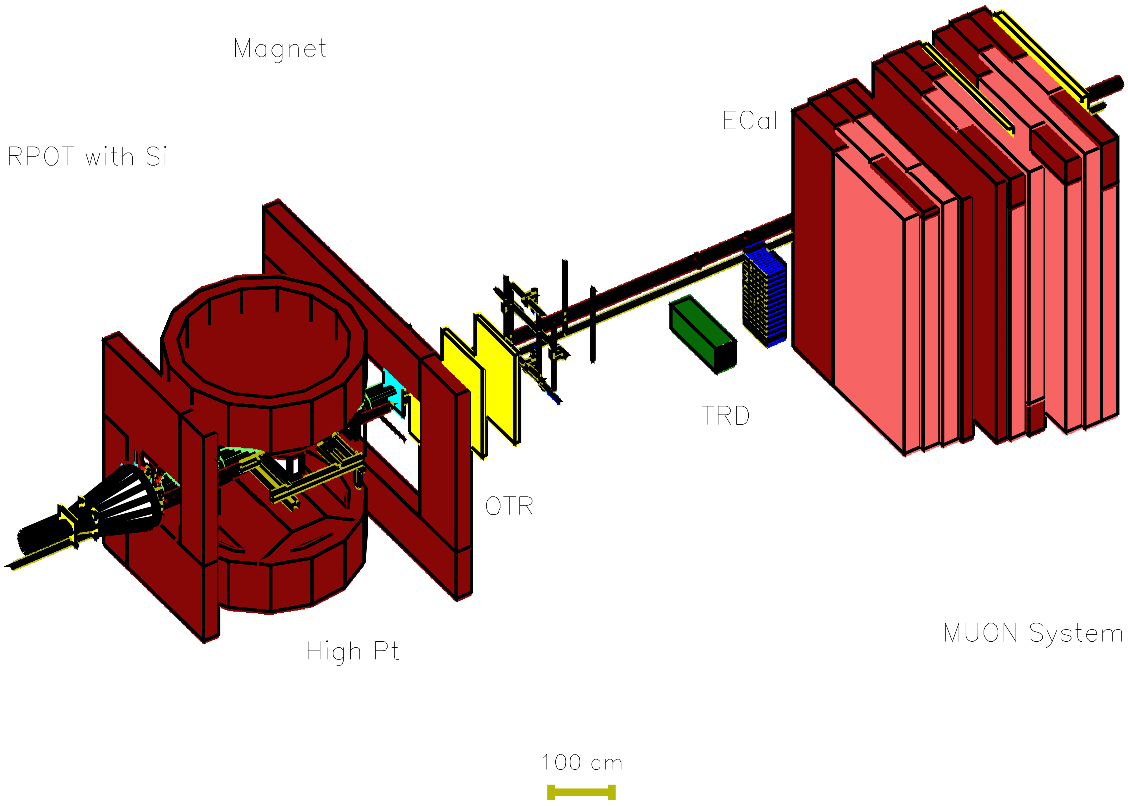
OUTLINE:

- Results from '97 Run
- Subsystem Status
- 1998 Plans
- Summary


-X SIDE ↑
Top View
220 mrad
250 mrad
Proton Beam
Electron Beam
Si-Strip Vertex Detector
Target Wires
Inner/Outer Tracker
Ring Imaging Cherenkov Counter
Muon Detector
Calorimeter
TRD
Magnet
Vertex Vessel
20
15
10
5
0 m
Side View
160 mrad
Photon Detector
Beam Pipe
Spherical Mirrors
C_4F_{10}
Planar Mirrors
Proton Beam
Electron Beam
The HERA-B Experiment at DESY

DETECTOR SETUP IN 1997



- VDS-vessel with 3 double sided Si-strip detectors with 6000 channels and target wire
- Al beam pipe 0.5 mm
- Magnet and e-compensation coil
- High-Pt gas pixel chambers
- 3 superlayers of the OTR
- ECAL (16x12 matrix)
- 1 TRD Module
- MUON absorber with 24 tube and 7 pad chambers

RUN '97 GOALS

1) SUBDETECTORS OPERATION AND DESIGN:

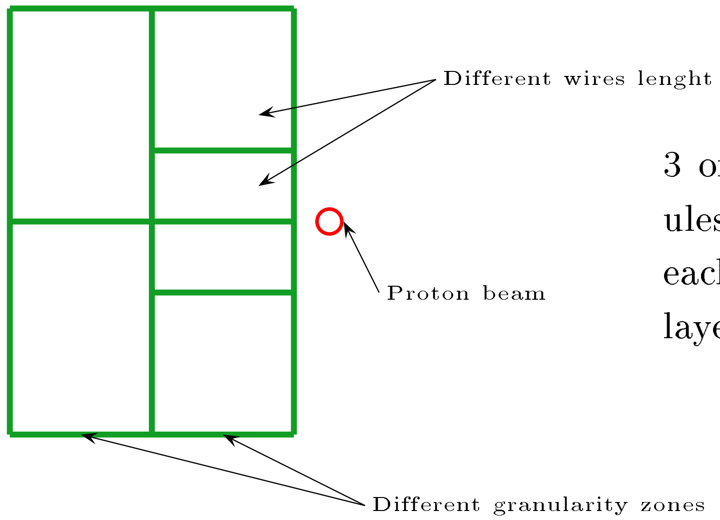
- Confirm and cross-check 1996 measurements:
  - Occupancies.
  - Background.
- Commission common DAQ.

  Individual final detector readout has already been done.
  - Debug reconstruction software.

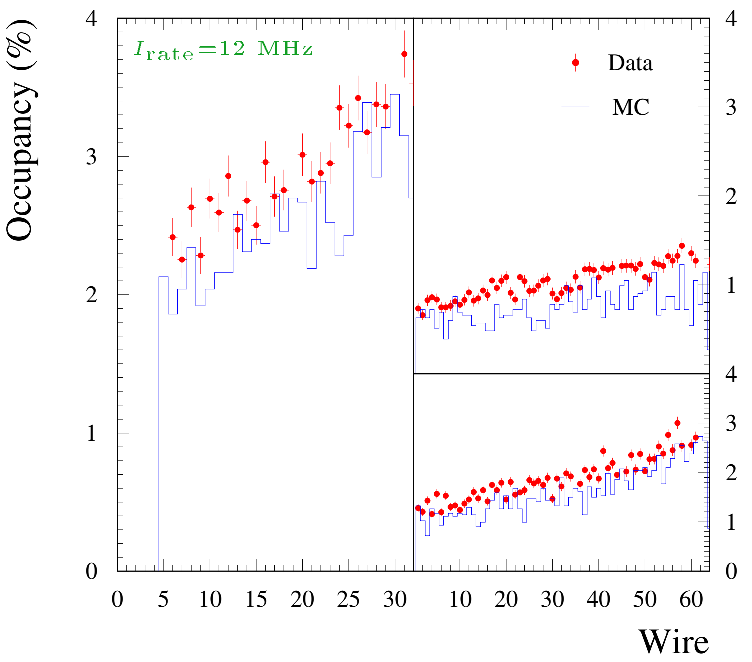
2) TEST NEW SUBSYSTEMS:

- Full Second Level Buffer functionality.
- Trigger (functionality of all levels).

Outer Tracker: Occupancy

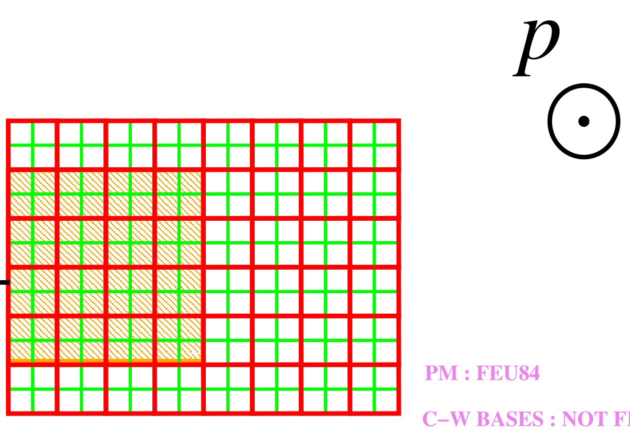


3 of such layer modules are installed in each of the 3 superlayers



Agreement of the order of 10-15% between data and MC

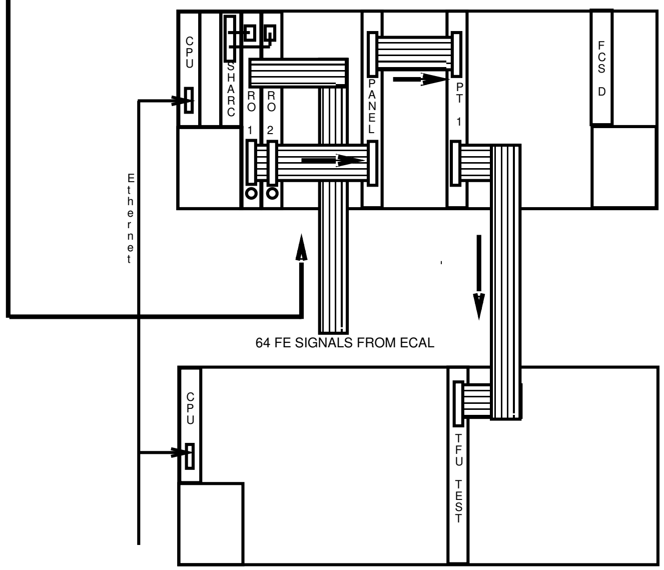
ECAL OCCUPANCY

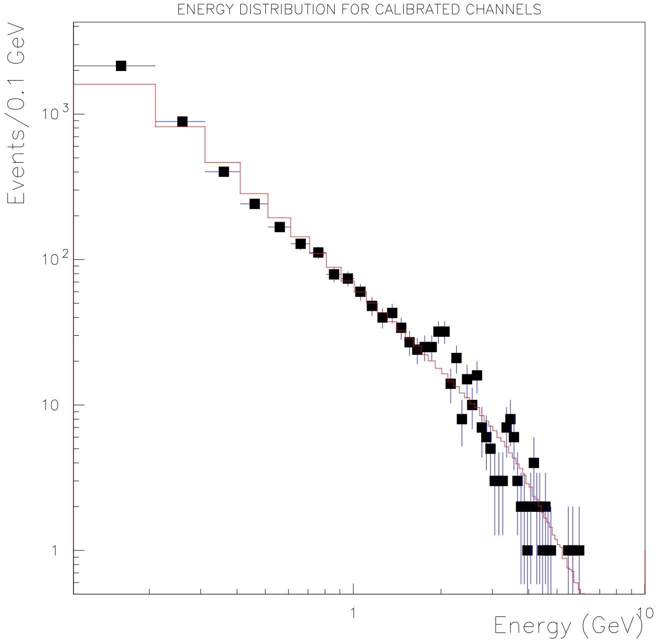


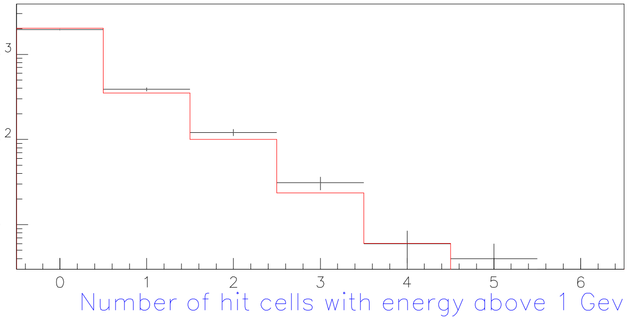
PM : FEU84

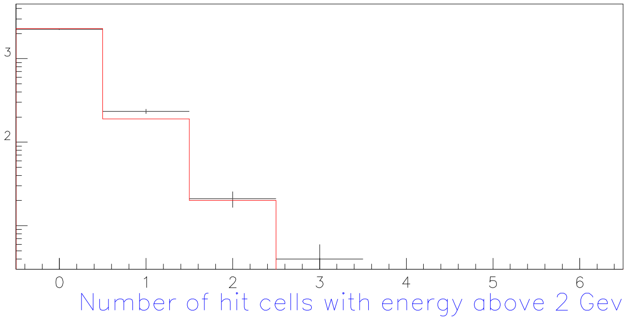
C–W BASES : NOT FINAL DESI

48 MIDDLE MODULES = 192 C







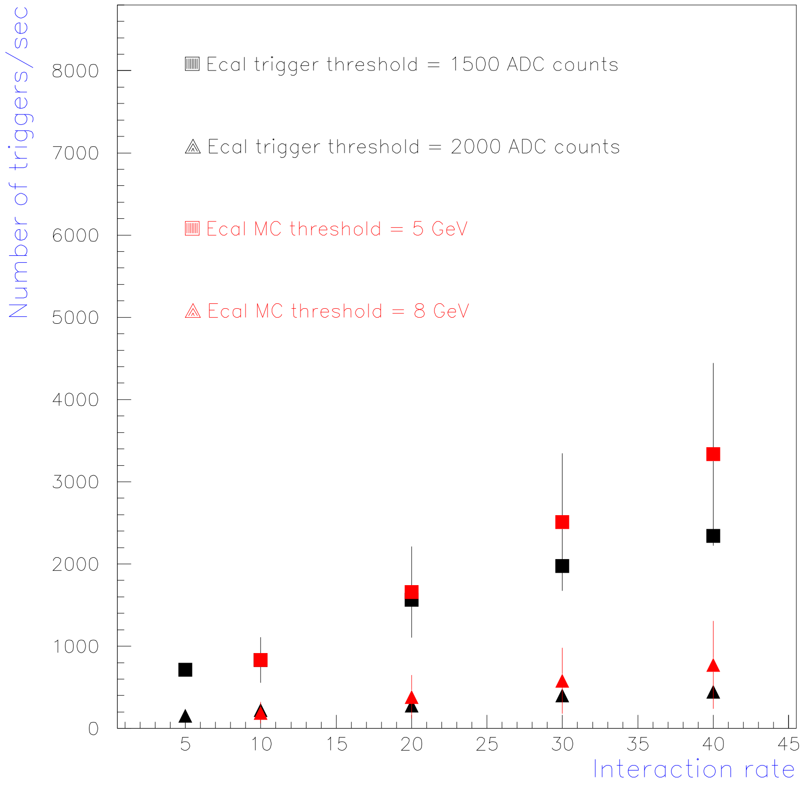


ELECTRON TRIGGER

Besides testing the correct ELECTRON TRIGGER - TFU communication the electron trigger has been used to trigger on the following events:

- at least one tower of the readout instrumented ones above a preset energy threshold

The energy threshold has been chosen according to the criteria that will be followed for the HERA - B running



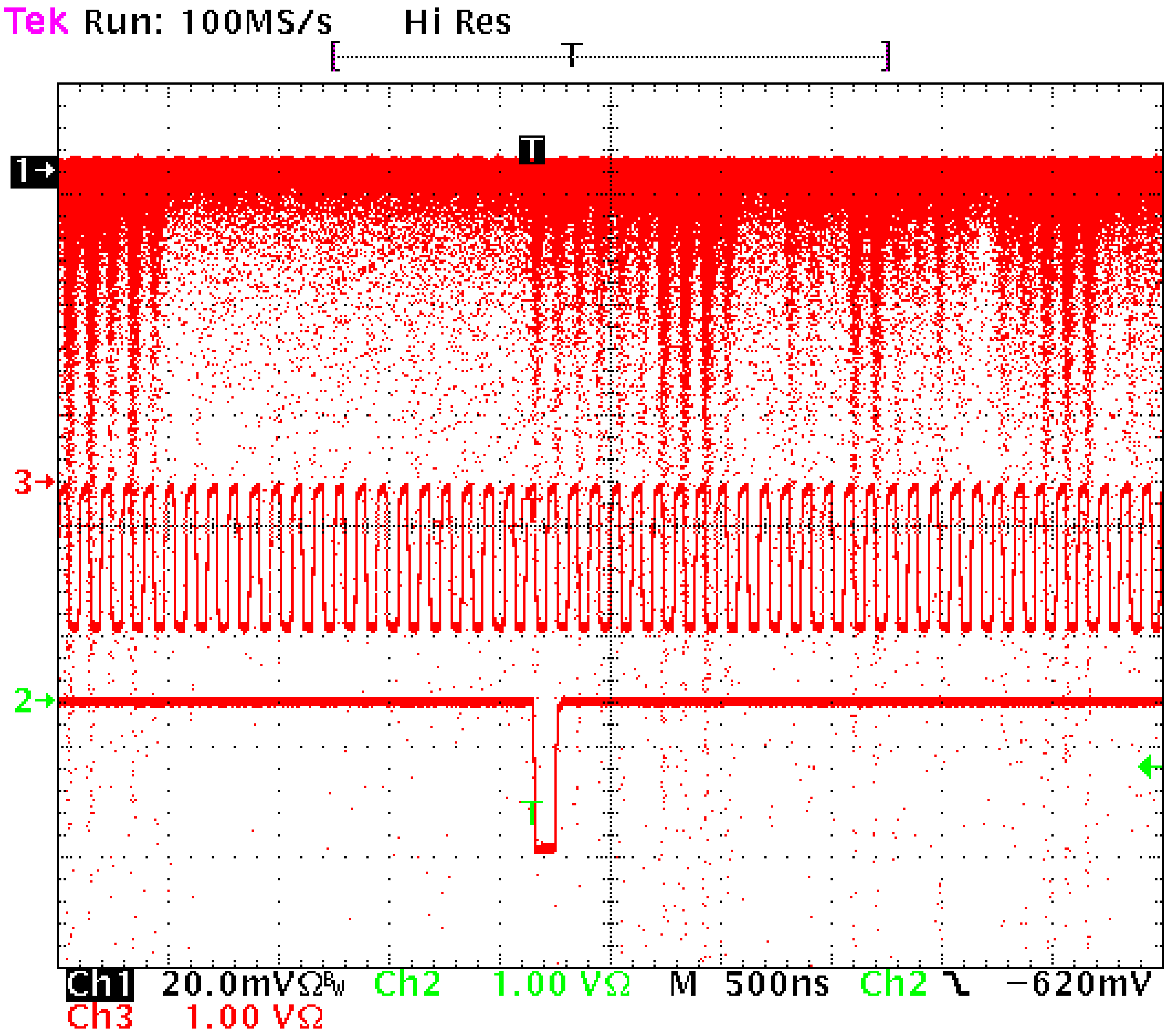
FIRST HERA-B COMMON DAQ RUN

THE DETECTORS INSTALLED IN THE EXPERIMENTAL SETUP WERE RUN IN COMMON DAQ MODE

- Syncronization of the different FED pipelines
- Check of the FEDs
- Check of the FCS
- Check of the EVENT BUILDING by means of SLB SHARC BOARDS
- Check of ELECTRON TRIGGER capabilities
- Check of the DAQ PROGRAMS
- Check of the MONITOR PROGRAMS
- Check of the RECONSTRUCTION SOFTWARE

$\Longrightarrow$ POWERFUL DIAGNOSTICS !

ALIGNMENT TO HERA-B BX STRUCTURE



BX STRUCTURE

measured by

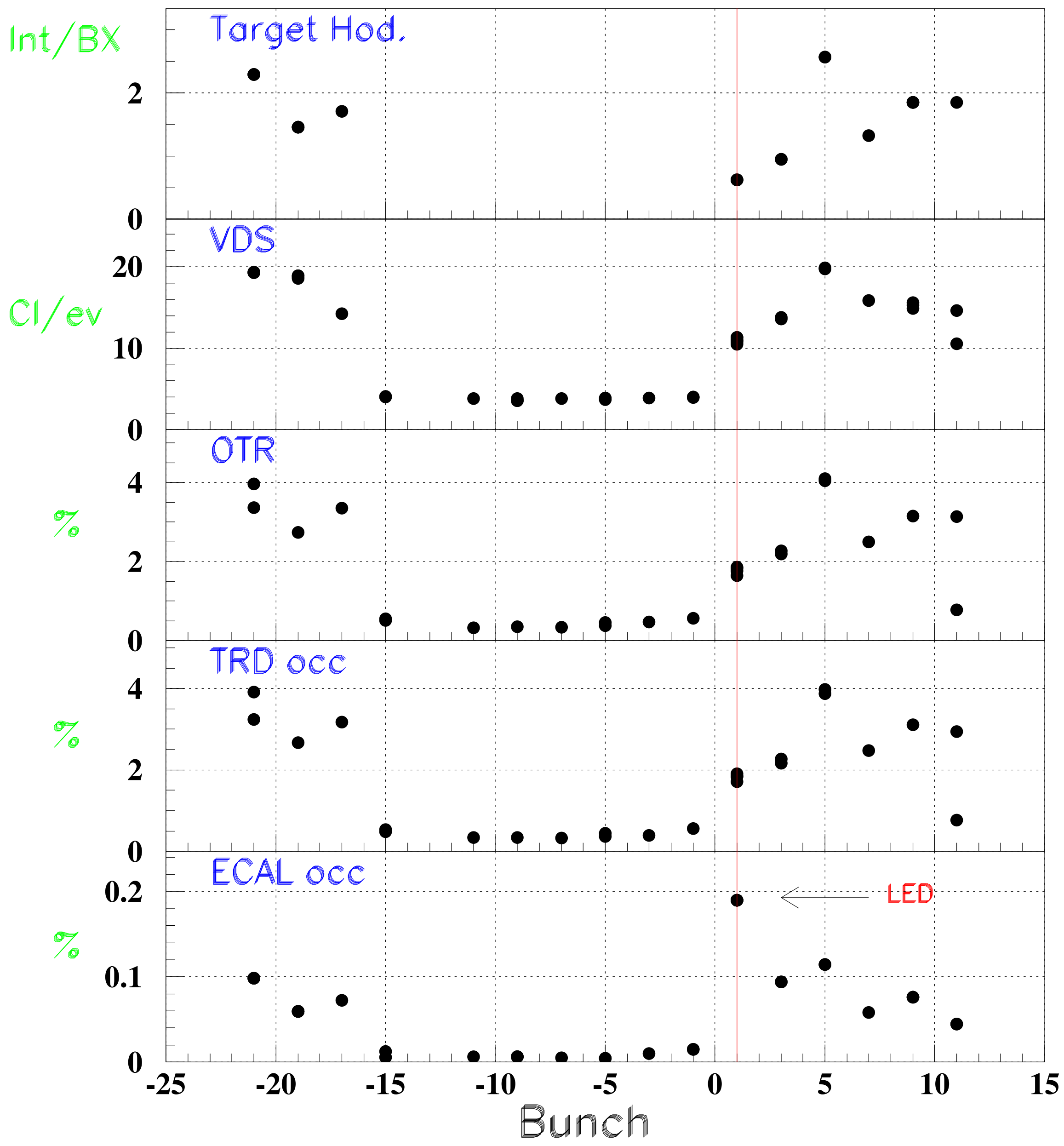
an ECAL tower

HERA-B CLOCK

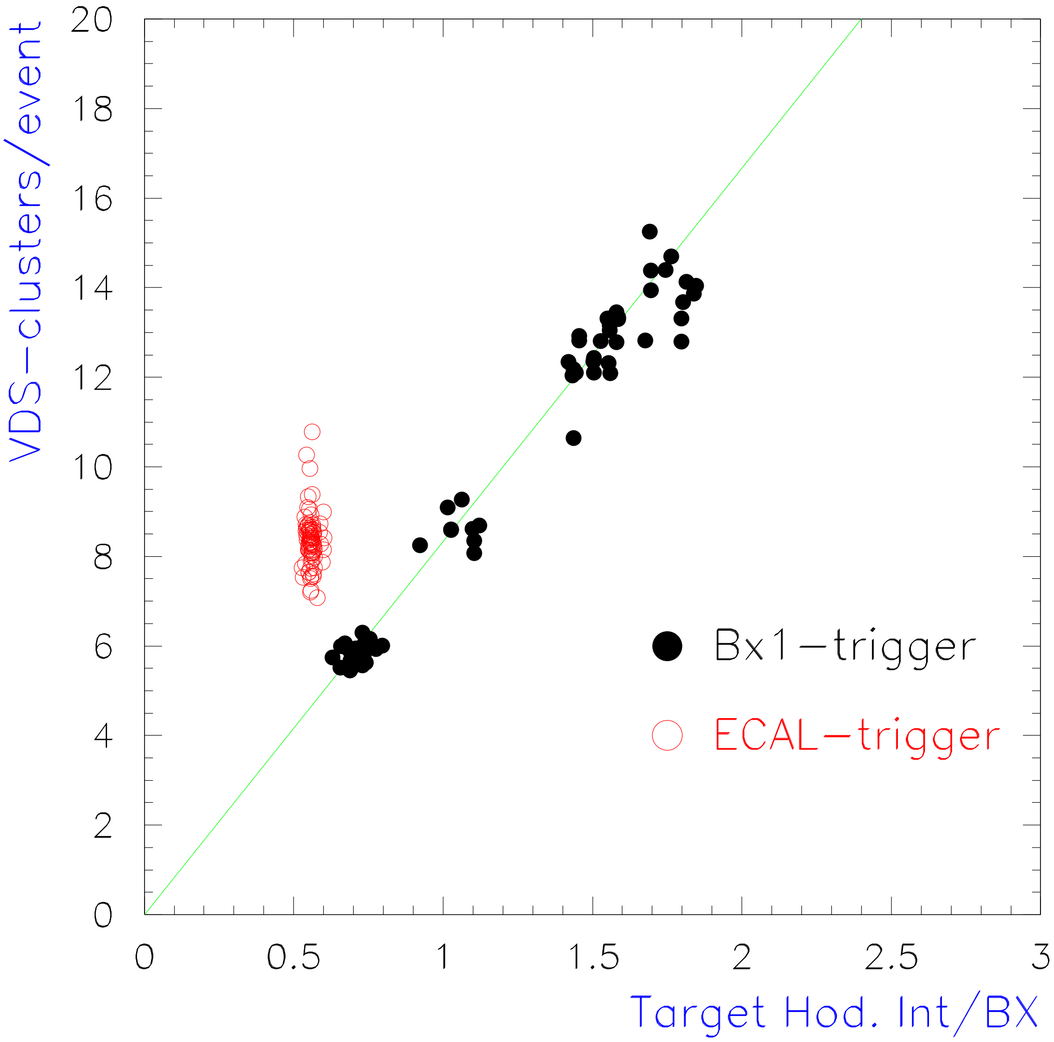
1^{st} BX

12 Jul 1997
10:54:00

DETECTORS TIME ALIGNMENT



97/07/23 01.10



VERTEX DETECTOR CORRELATIONS WITH ELECTRON TRIGGER

SUBSYSTEM STATUS '98

SUBSYSTEM	OK ?	TO BE INSTALLED IN 1998
TARGET	OK	2x4 wires
VERTEX	funding production	-X side: 12 double 2 single sided modules
INNER TRACKER	R&D	2 superlayers (also 2 half sl possible)
OUTER TRACKER	R&D production	2 superlayers in the magnet -X side: 2 superlayers -X side:2 superlayers
HIGH-p_T CHAMBERS	funding	1 outer (50% RO) 3 pixel proto (1024 ch. RO) **PRE-TRIGGER PROVIDED**
RICH	funding	mechanics complete 25 % RO
TRD	funding	4 large modules (80 %) little RO
ECAL	OK	full system **PRE-TRIGGER PROVIDED**
MUON	$\simeq$OK	1 superlayer tubes,no pixels 2 sl. pads and pixels **PRE-TRIGGER PROVIDED**
FLT	$\simeq$ OK	operational
SLT	funding	20 nodes up 5 kHz FLT rate
LEVEL 3&4	funding	operational with few nodes adapted to detector needs
DAQ	OK	operational with 50 % channel capacity
RECONSTR.	OK	operational for 1999 mode 1998 SW partly from SLT

1998 GOALS

TECHNICAL GOALS

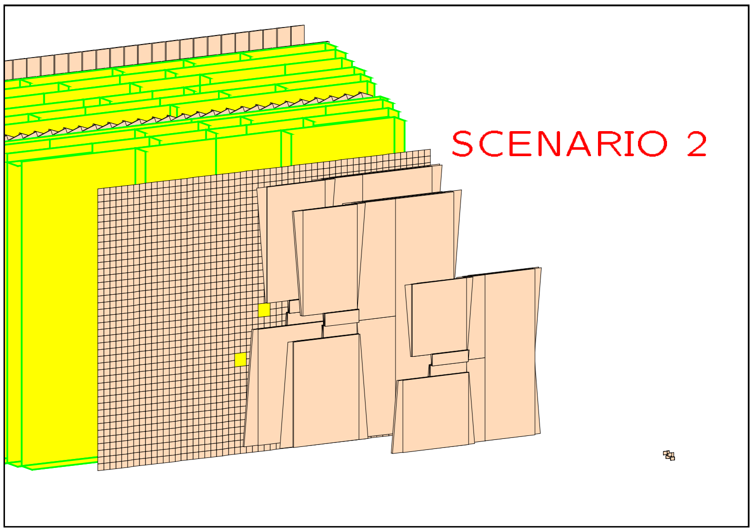
- Commissioning and debugging of subsystem and stand-alone daq
- Commissioning of as many FLT as feasible
- Commissioning of Common DAQ
- Commissioning of online calibration and alignment
- Commissioning of wire steering feedback system for automatic rate stabilization (ECAL, MUON, HIGH-Pt)
- Commissioning of online vertex finding and multi-wire steering
- Commissioning of reconstruction algorithms
- Commissioning of online reconstruction
- Systematic testing of the whole system at low, medium and highest rates

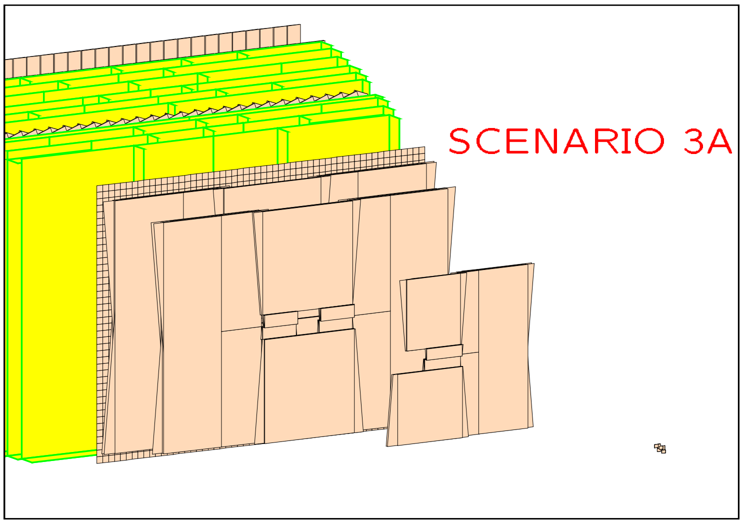
1998 GOALS

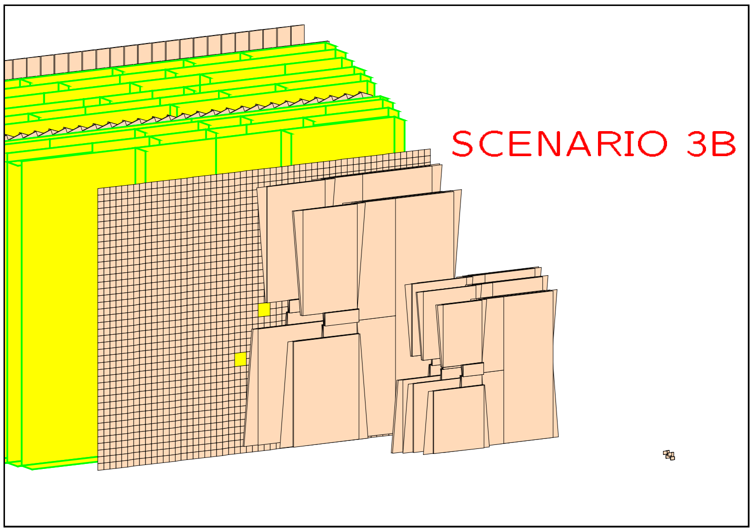
PHYSICS GOALS

- Establish a J/ψ signal in the triggered events $(\sigma_{c\bar{c}})$
- Try to establish an Υ signal in the triggered events $(\frac{\sigma_{b\bar{b}}}{\sigma_{c\bar{c}}})$
- Measure J/ψ vertex positions establishing a signal for events detached from the primary vertex $(\mathrm{Br}(b \to J/\psi) \cdot \sigma_{b\bar{b}})$
- Measure and characterize backgrounds for the above signals

THE SCENARIOS STUDIED FOR 1998

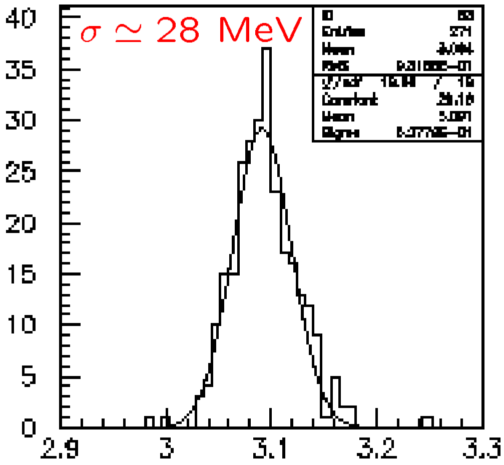




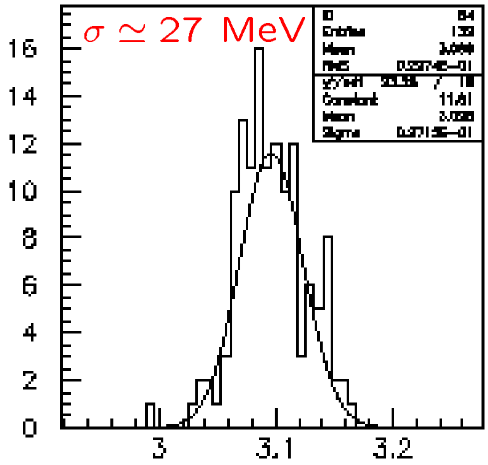


The reconstructed Invariant Mass

$J/\psi \to \mu^+\mu^-$

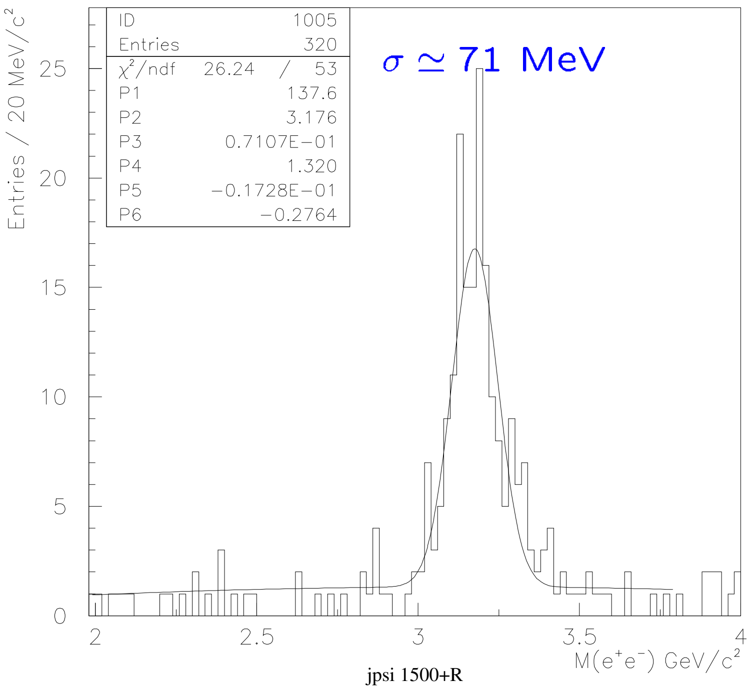


3A



3B

$J/\psi \to e^+e^-$



Only ECAL

NO MAGNETIC FIELD

OVERALL EFFICIENCIES

$J/\psi \to \mu^+\mu^-$ reconstruction efficiencies. 1 signal per BX				
	Scenario 2	Scenario 3A	Scenario 3B	full OTR
	4.6%	10.6%	5.4%	21%

$J/\psi \to \mu^+\mu^-$ reconstruction efficiencies. 1 signal per BX + 4 mb				
	Scenario 2	Scenario 3A	Scenario 3B	full OTR
	2.4%	6.6%	5.1%	21%

Reconstructed Events				
	Scenario 2 (4 MHz)	Scenario 3A (4 MHz)	Scenario 3B (4 MHz)	full OTR (4 MHz)
$J/\psi_{direct} \to \mu^+\mu^-$	228000	269000	277000	601000
$b \to J/\psi \to \mu^+\mu^-$	73	78	80	163
$\Upsilon(1S) \to \mu^+\mu^-$	24	40	31	69
$\Upsilon(2S) \to \mu^+\mu^-$	7	12	10	21

- A running time of 10^6 s has been assumed under the conservative assumption of an I.R. of 4 MHz ($<$ 1 interaction / BX)
- If background turns out to be reasonably low the $\sigma_{b\bar{b}}$ could be measured with a statistical error $\simeq$ 10 % from the muon sample alone
- The scenario 3B looks more robust (Pattern Recognition capability, higher rate capability)

SUMMARY

- Important debugging of many subsystems in the common DAQ mode (detector FEDs, FCS, SHARC boards, SLB, DAQ program, detector time alignment)

- Events in common DAQ mode has been taken with an electron trigger active.

- Open problems (ITR,OTR) still exist.

- The 1998 HERA-B detector should allow the reconstruction of a significant sample of direct J/ψ and $b \to J/\psi$ events