KLOE
Y2k Experience

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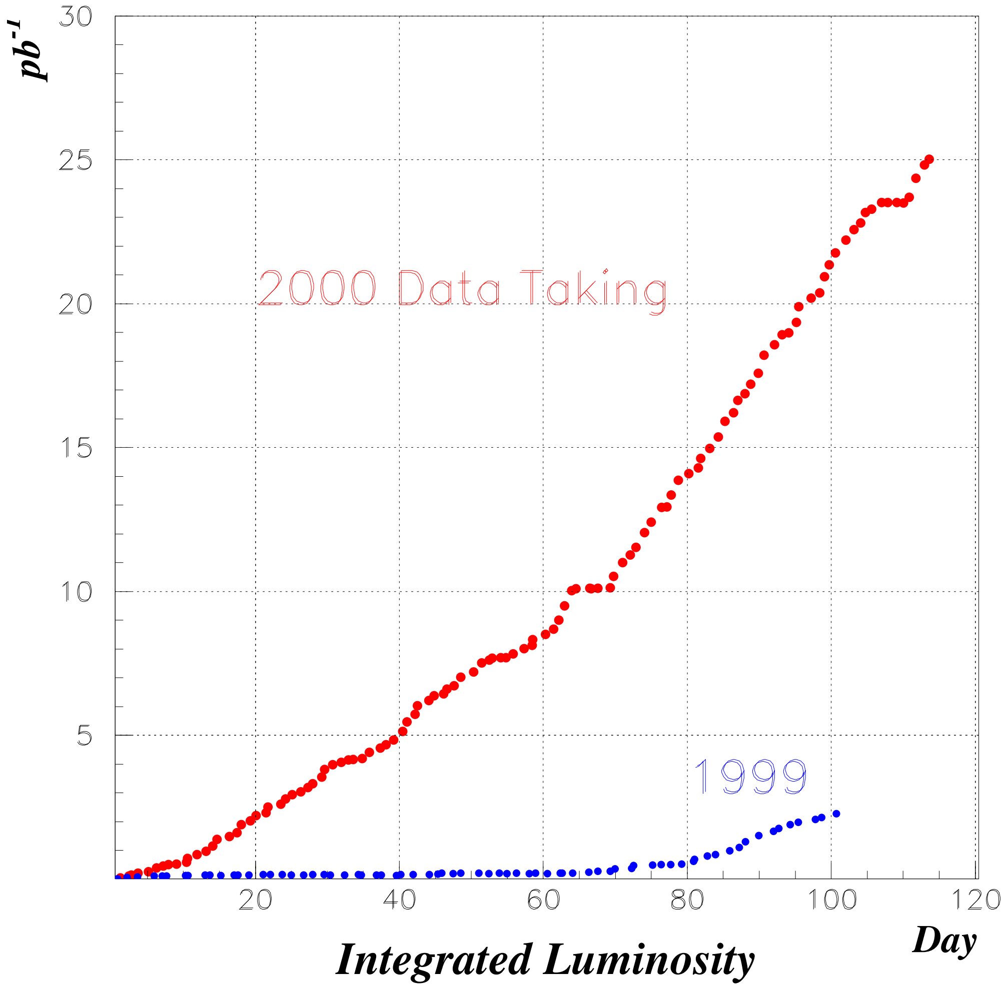
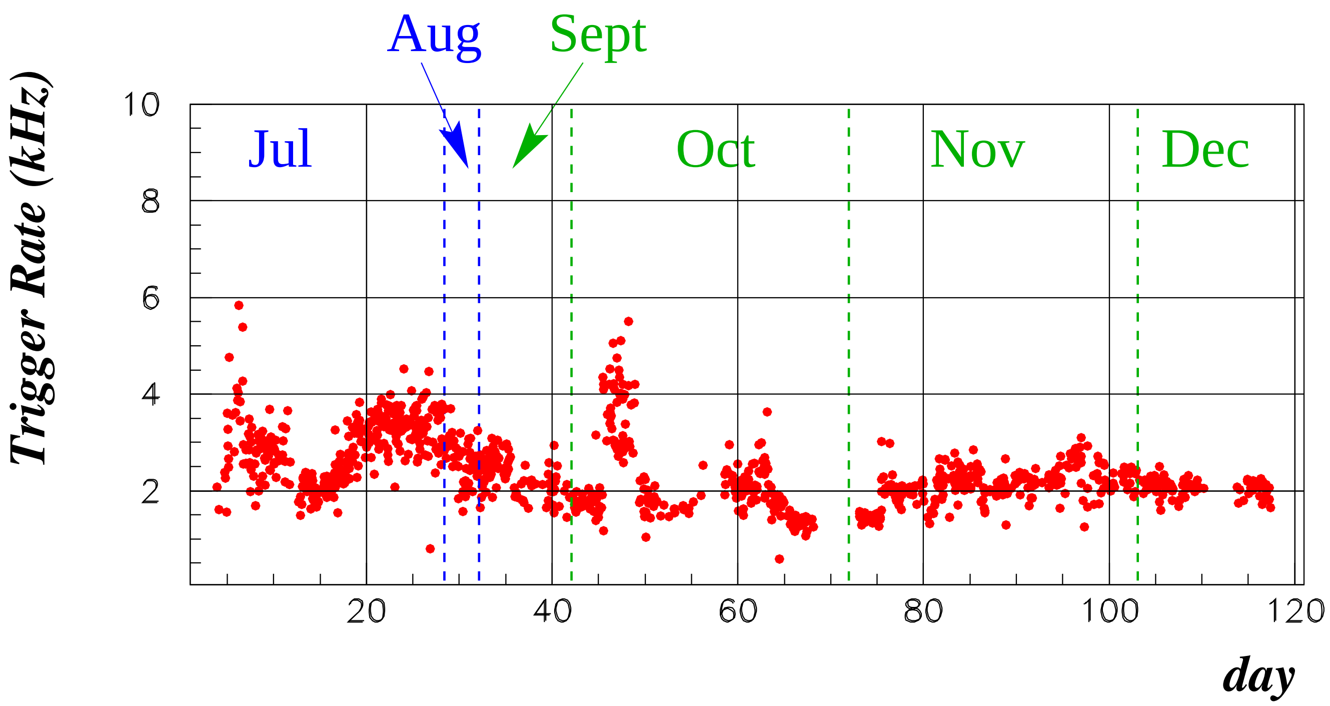
representing the
KLOE Collaboration

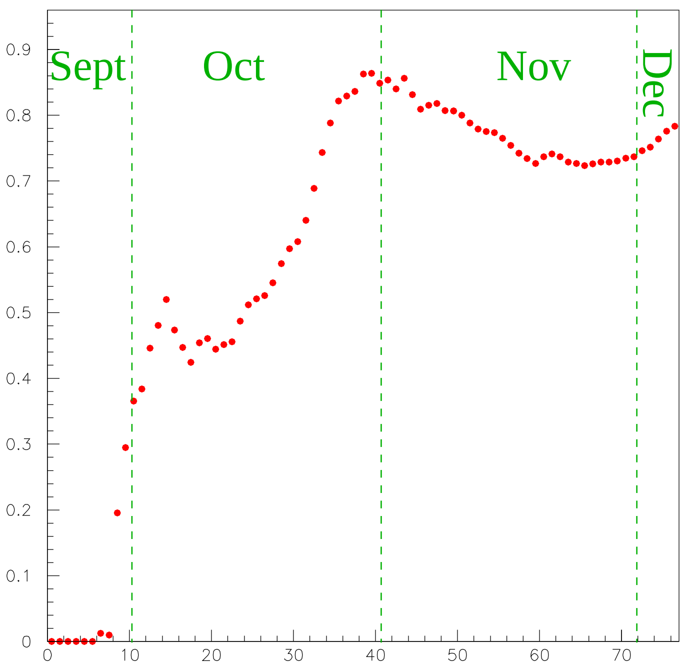
Year 2000 Data taking



Triggers	**8,778,429,561**
Bhabhas	153,190,100
K^+K^-	24,669,090
$K_S \rightarrow \pi^+\pi^-$	12,595,700
$\pi^+\pi^-\pi^0$	7,139,566
$K_S \rightarrow \pi^0\pi^0$	4,719,275
$\eta \rightarrow \gamma\gamma$	235,215

Trigger Rate & Data Processing

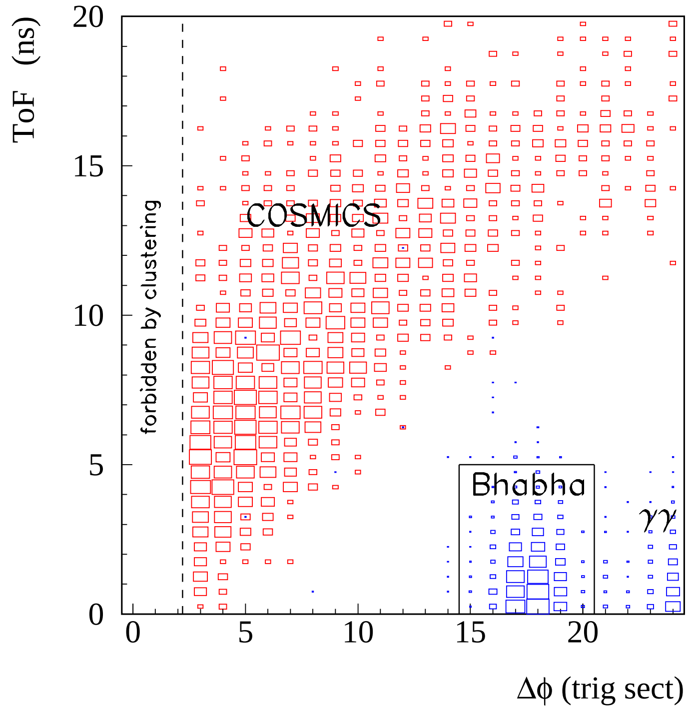




Fraction of Analyzed Triggers

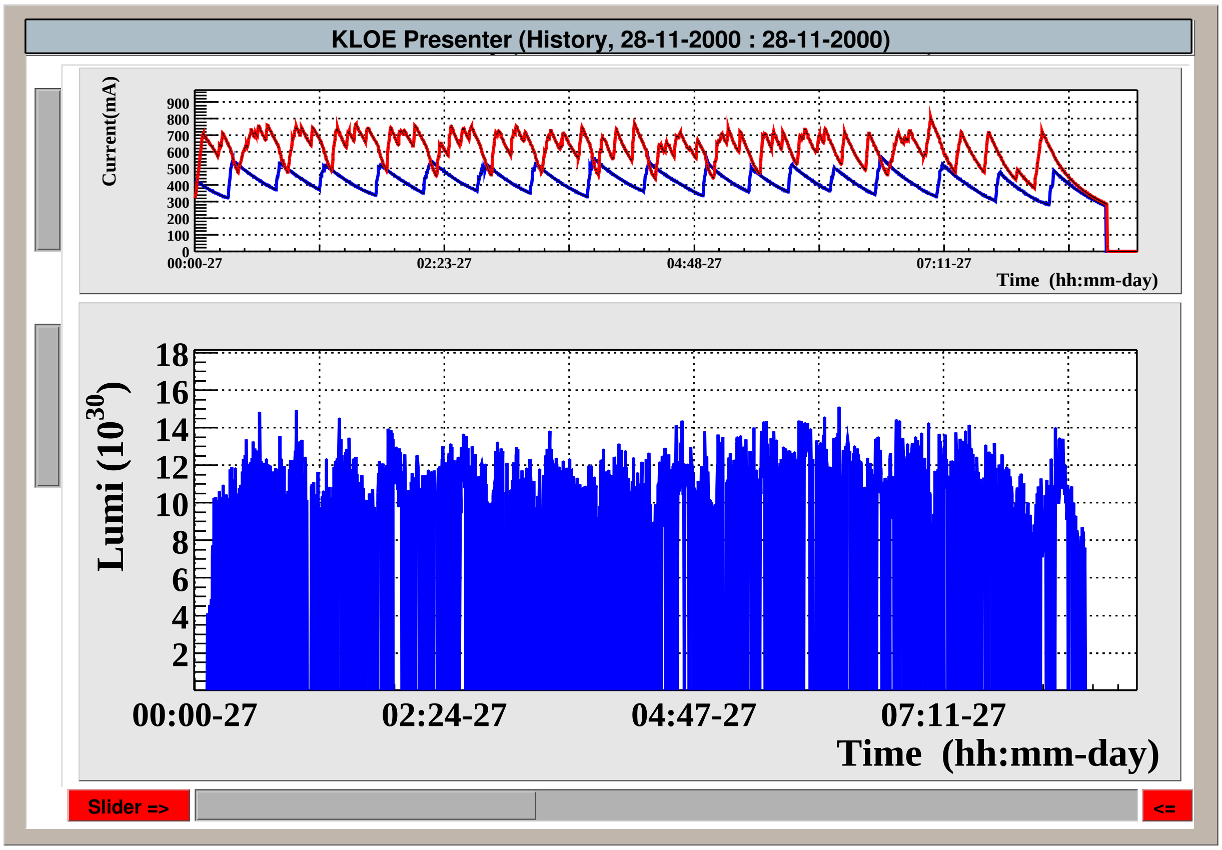
event size	2.5 kbytes
Mb/s	5-10
stored tapes	642/5500
bhabha tapes	62
proc. rate	1 kHz
EMC trg only	2.2 kHz

Luminosity monitor

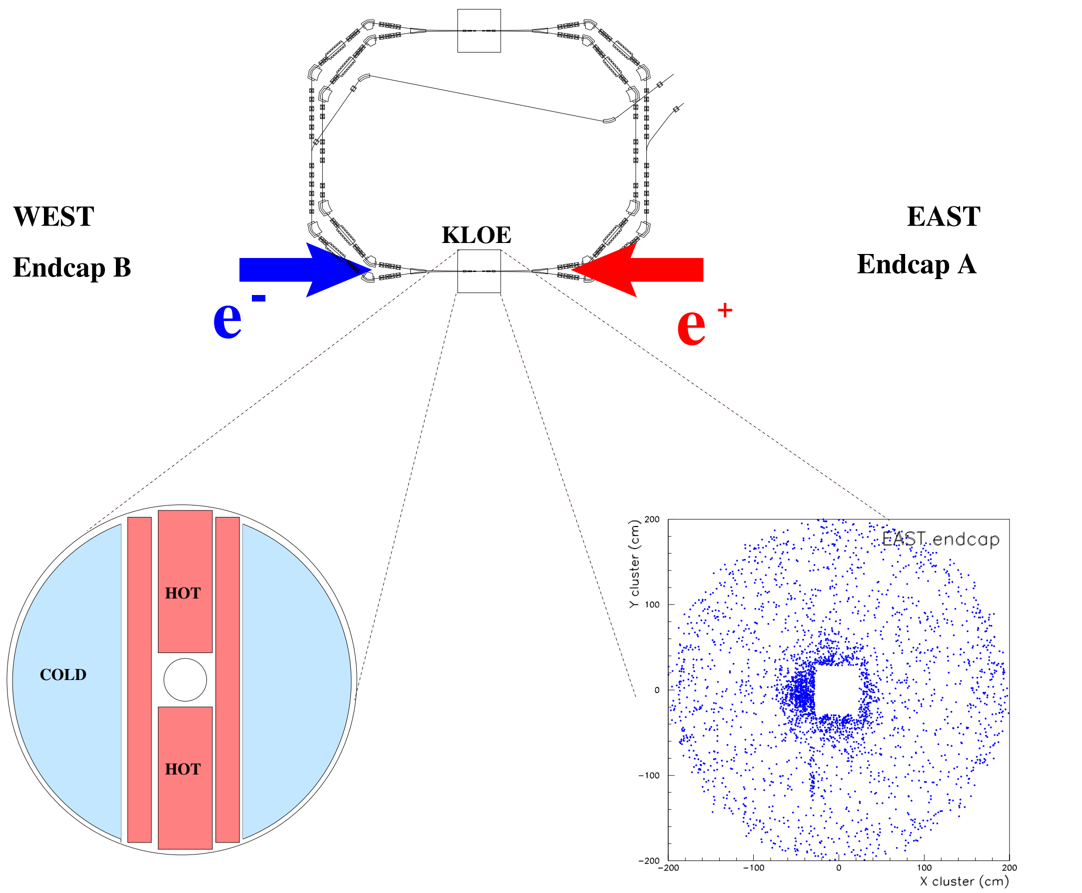


1. Two "Bhabha" trigger sectors with E > 400 MeV;
2. $\sim$ back to back;
3. within a 5 ns time coincidence;

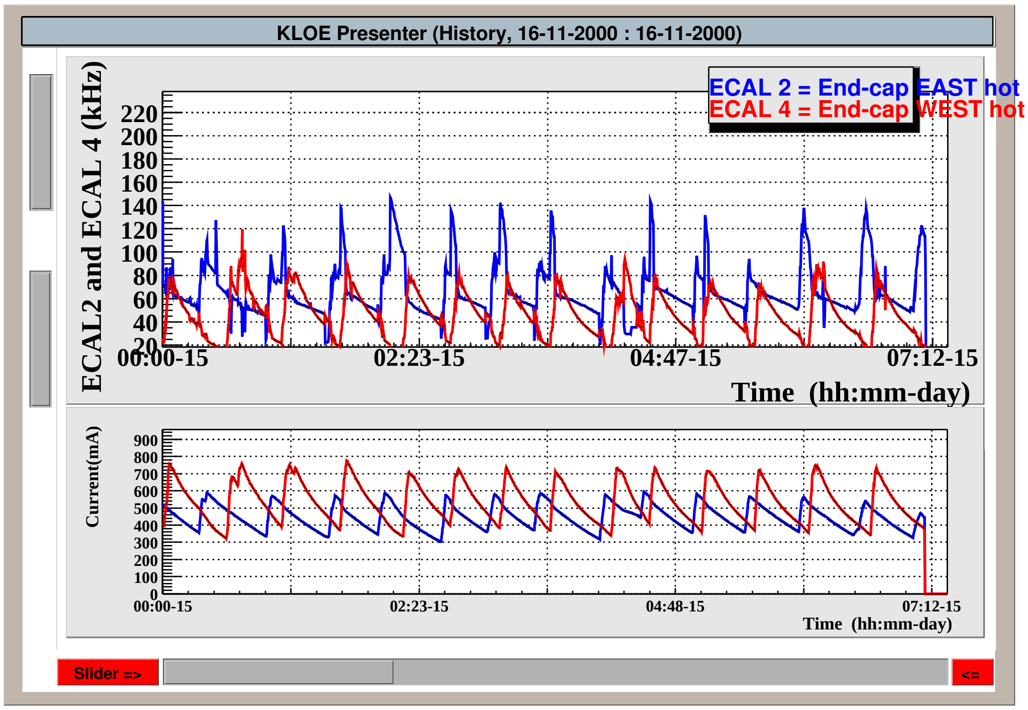
One luminosity measurement per minute at 10^{31} cm^{-2}s^{-1} with $\sigma_{STAT} = 5\%$



Machine background monitor

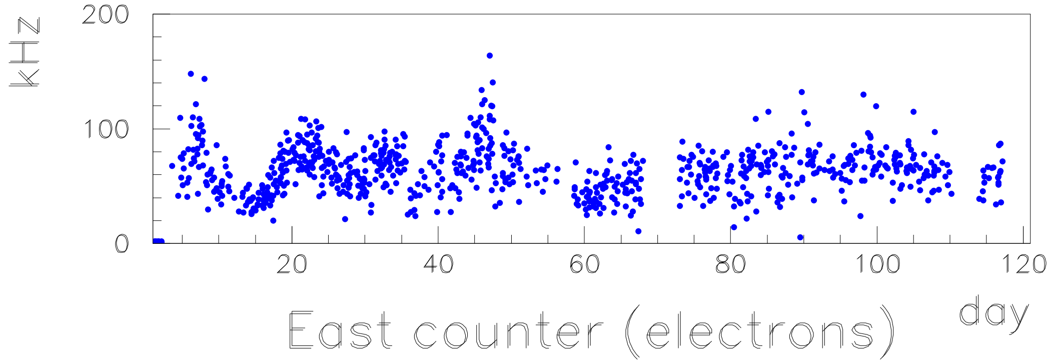


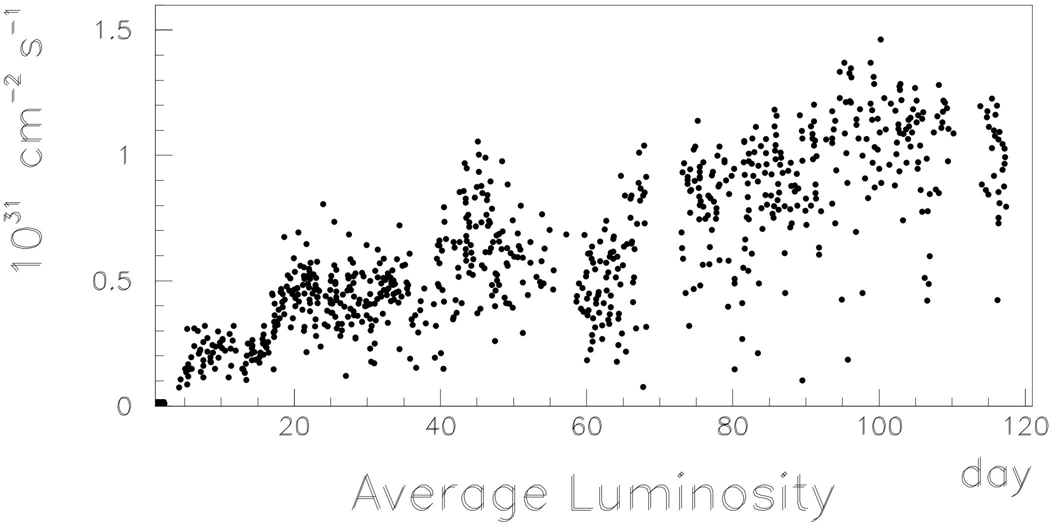
The Bhabha trigger sectors on the endcaps (E > 100 MeV) are **OR**-ed together in a "hot" and a "warm" counter

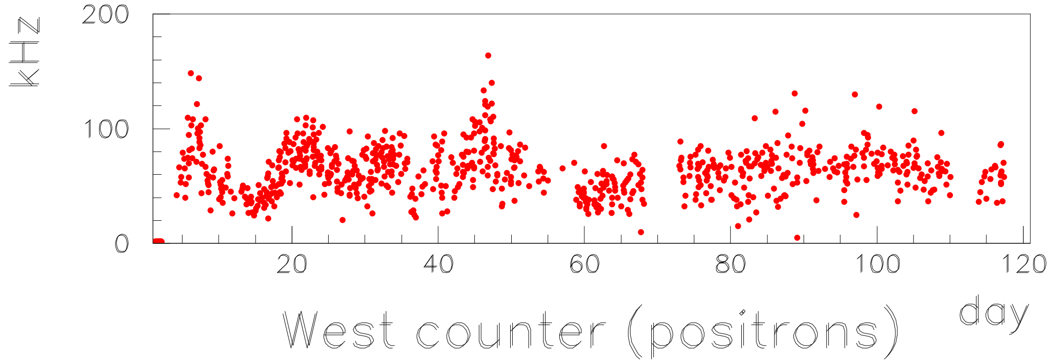


Good condition: below **80 kHz** after injection

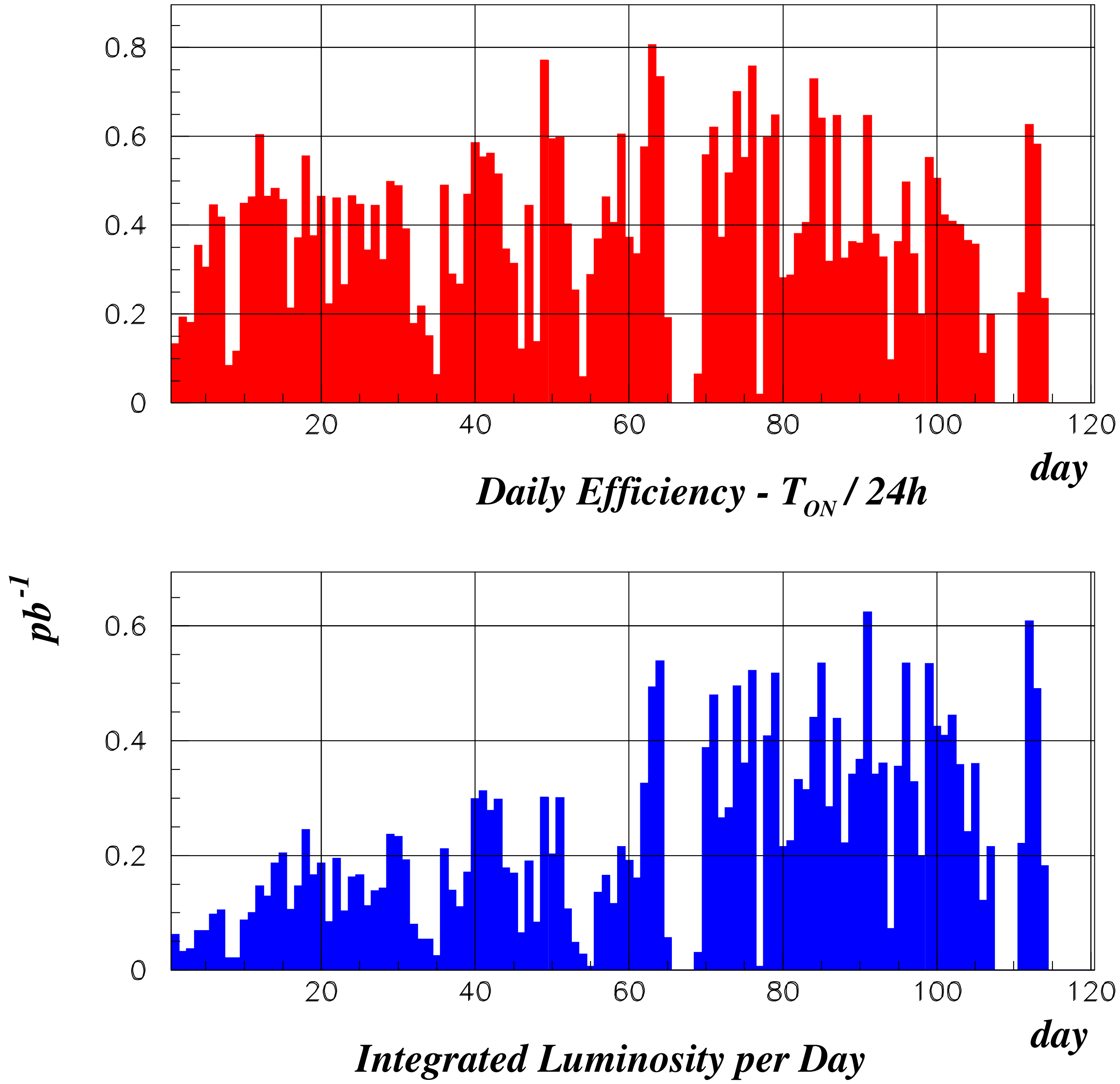
Average luminosity and background





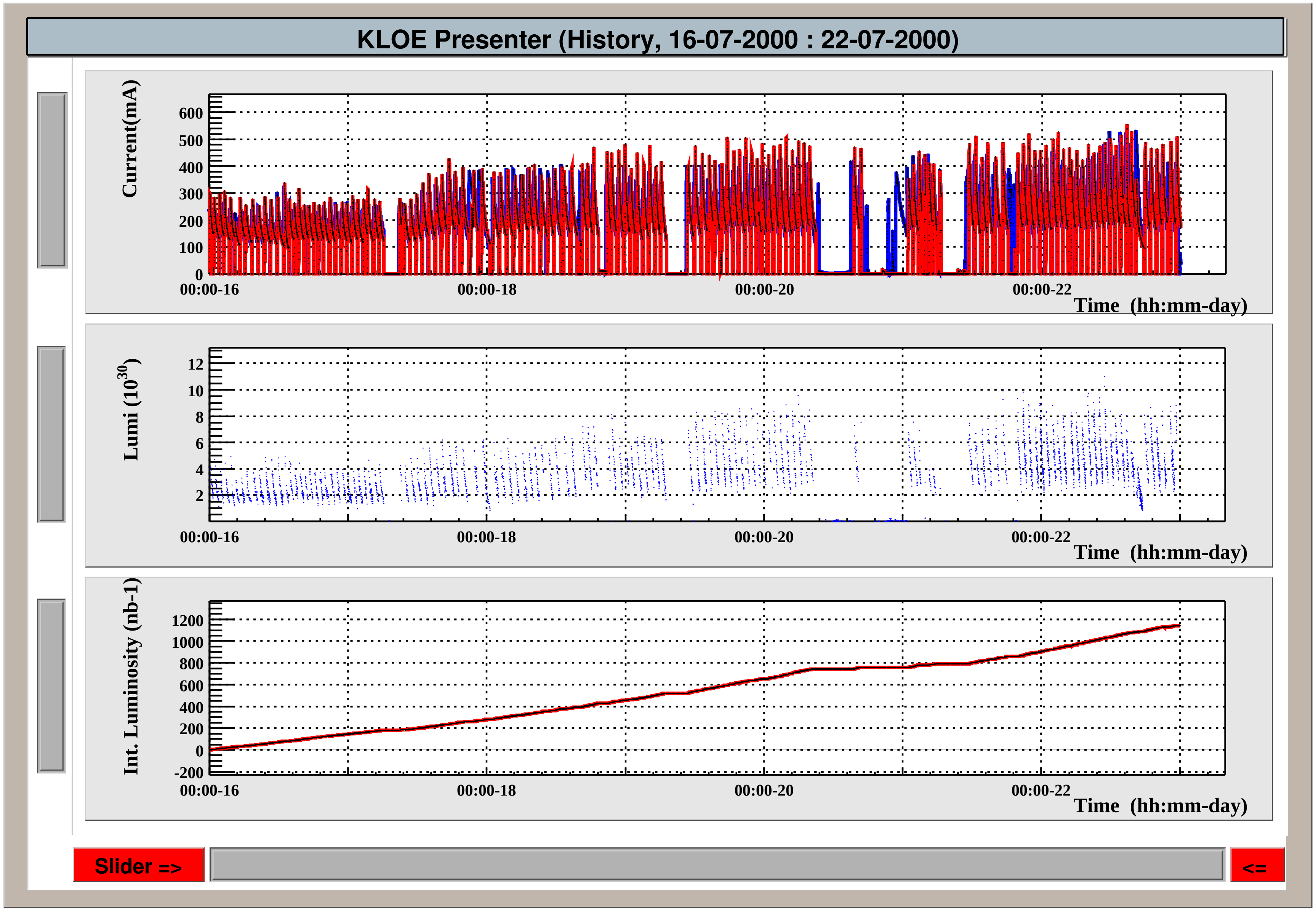


Integrated Luminosity per day

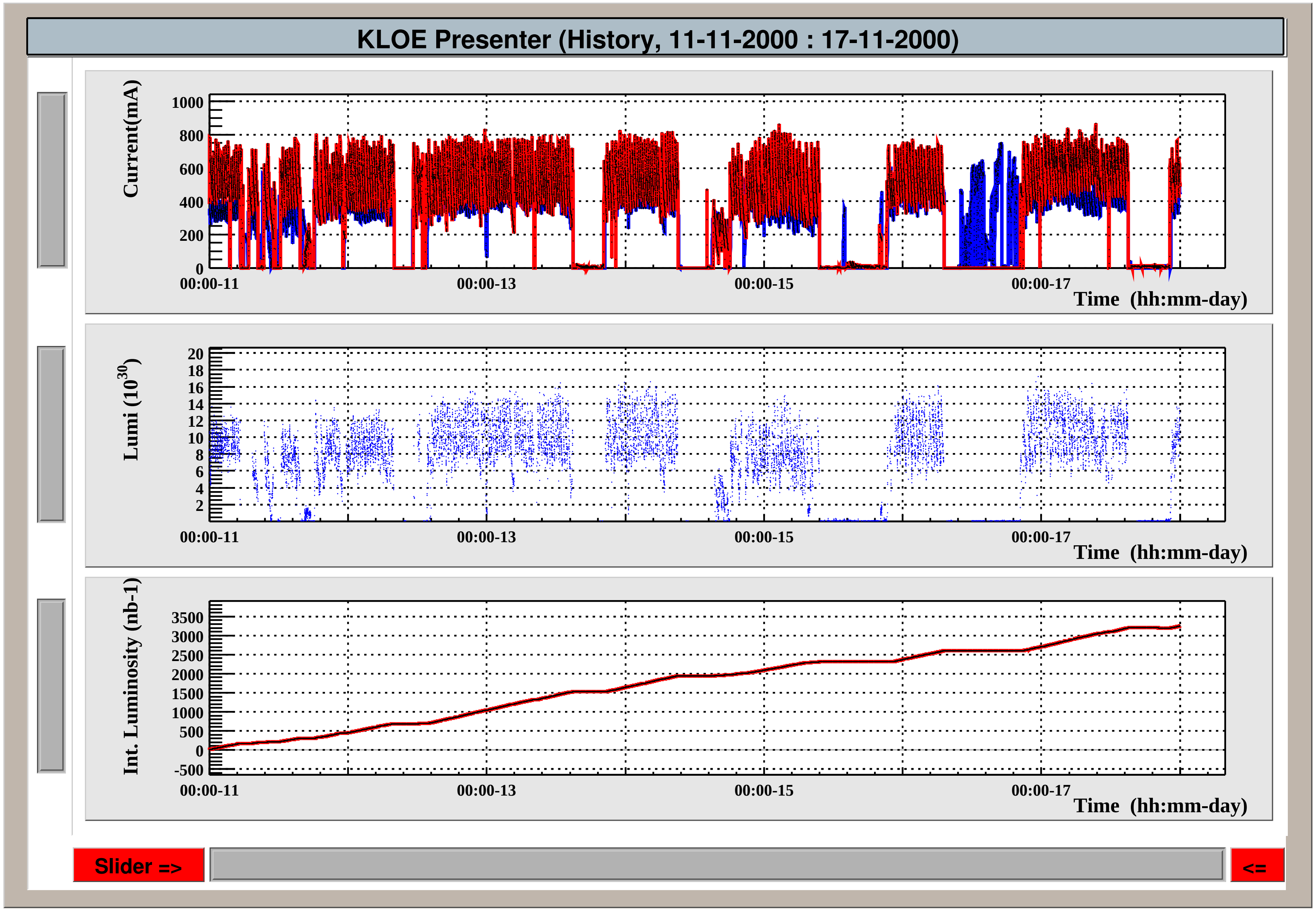


- Starting from **october** (day > 45) machine development during day
- Best integrated luminosity during a 24 hour period $\rightarrow$ **830** nb^{-1}, between 12 and 13 November

July 16-22: continuous KLOE data taking $\rightarrow$ 1 pb^{-1}

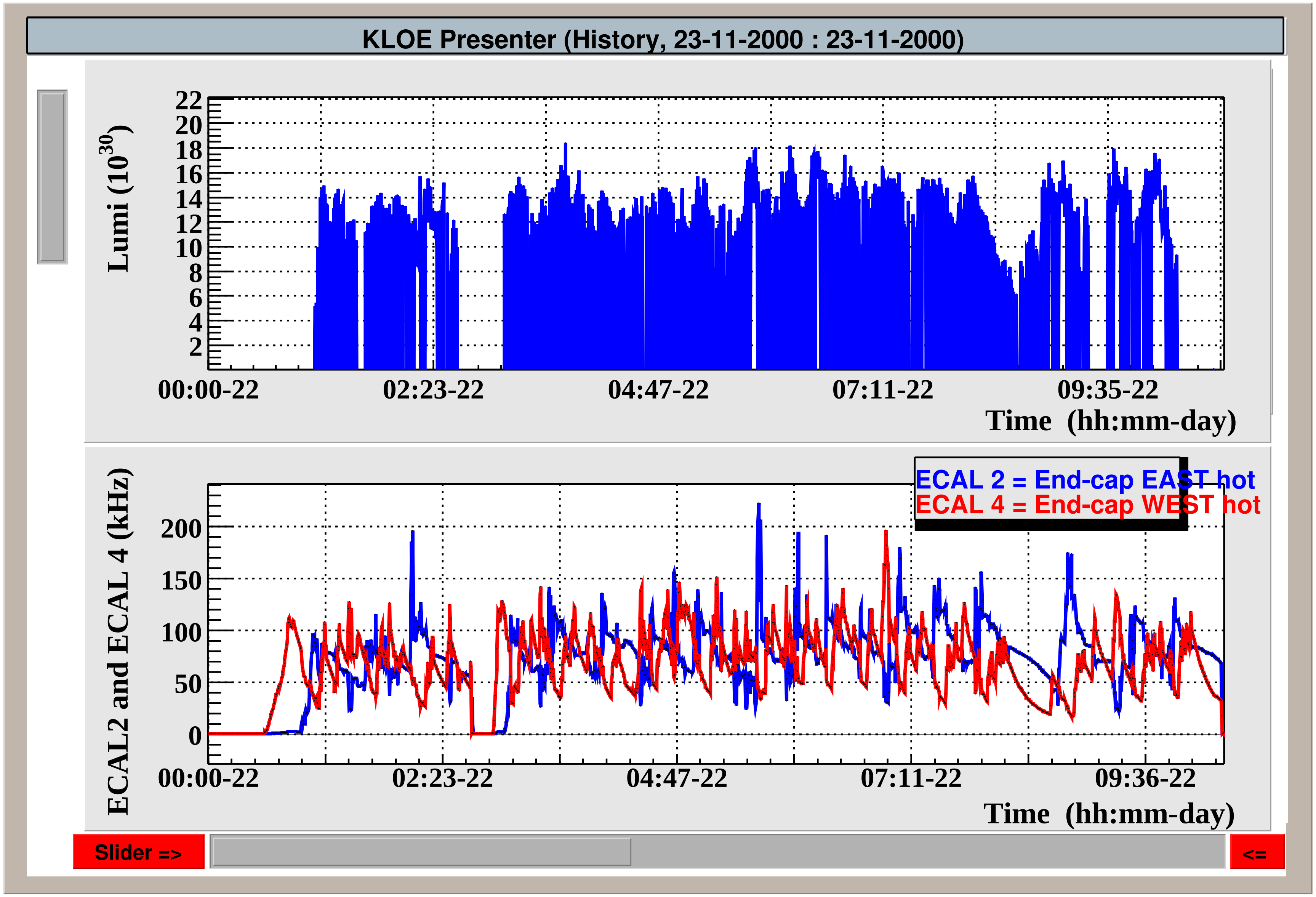


November 11-17: KLOE + machine development → 3.2 pb^{-1}



November 23: peak luminosity

$\mathcal{L}_{MAX} = 1.84 \times 10^{31}$ cm^{-2}s^{-1}; 350 nb^{-1} integrated during 9 hours.

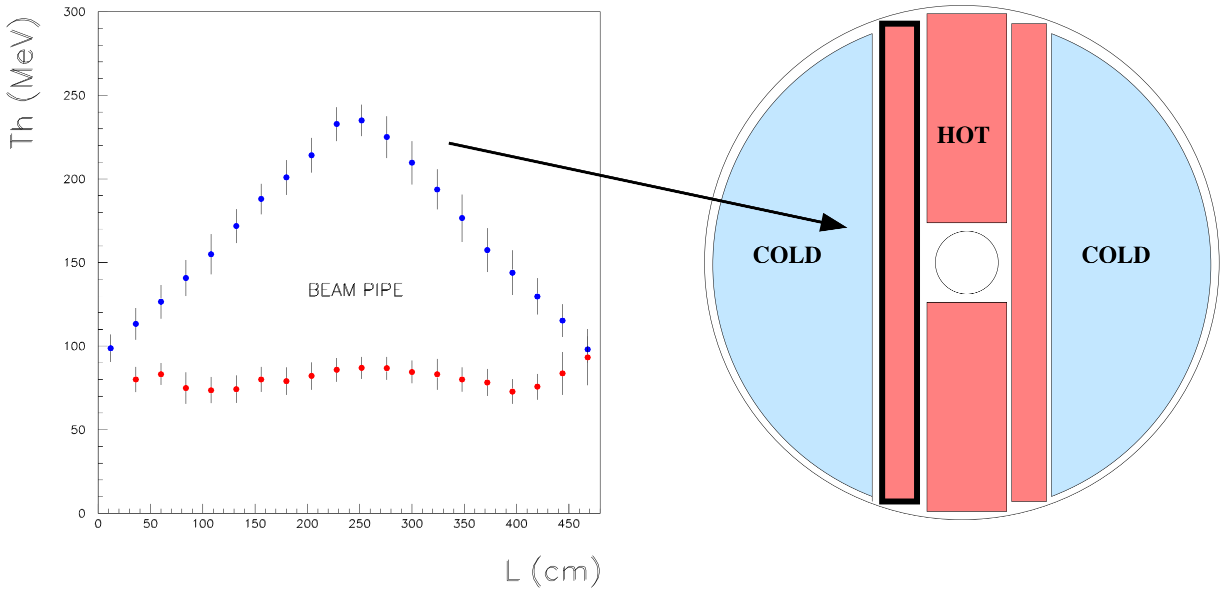


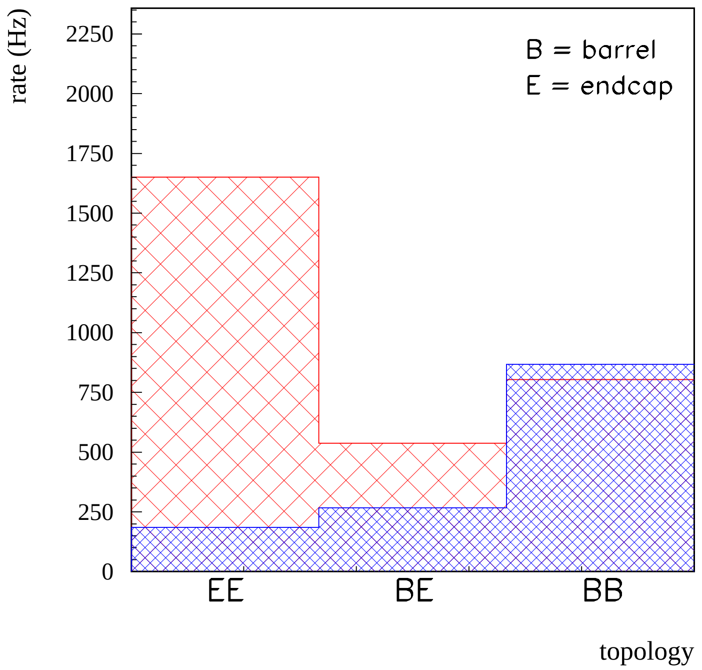
Detector operation

- Year 2000 data taking was really challenging for KLOE
- High background levels $\longrightarrow$ high trigger rate & “dirty” events
- Detector ageing (mostly drift chamber) has to be carefully considered
- Optimization of the drift chamber working parameters $\longrightarrow$ detector “robust”
- Trigger very adaptable (at the cost of some efficiency)

Background rejection with calorimeter trigger

Close to the beam pipe **higher** thresholds have been set in order to reject accidental coincidences of the two endcaps

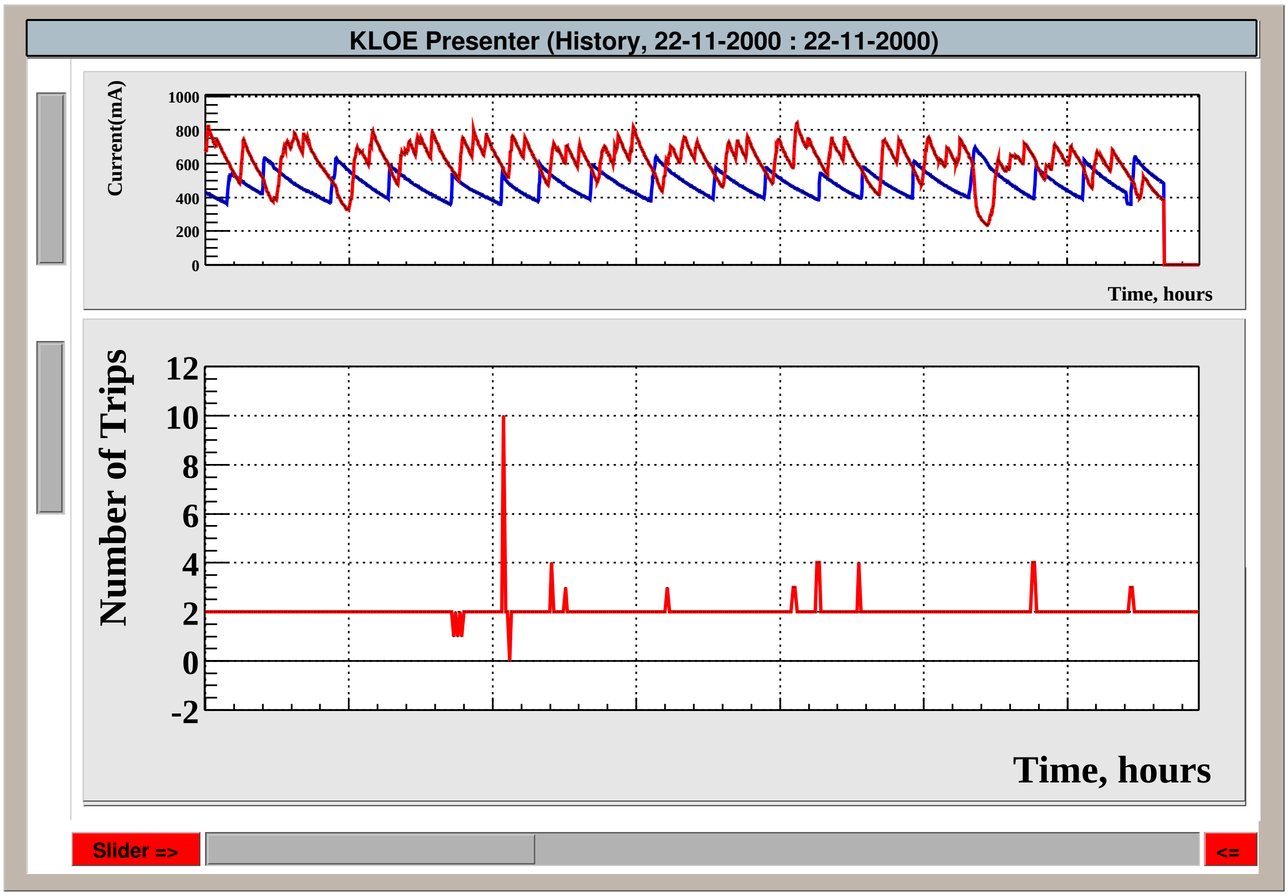




In the present running condition the unbalanced threshold map reduces the calorimeter trigger rate from ~ 3000 Hz down to ~ 1300 Hz.
The efficiency decrease is $2-3\%$ in $K_S \to \pi^+\pi^-$ decays.

Drift Chamber operation

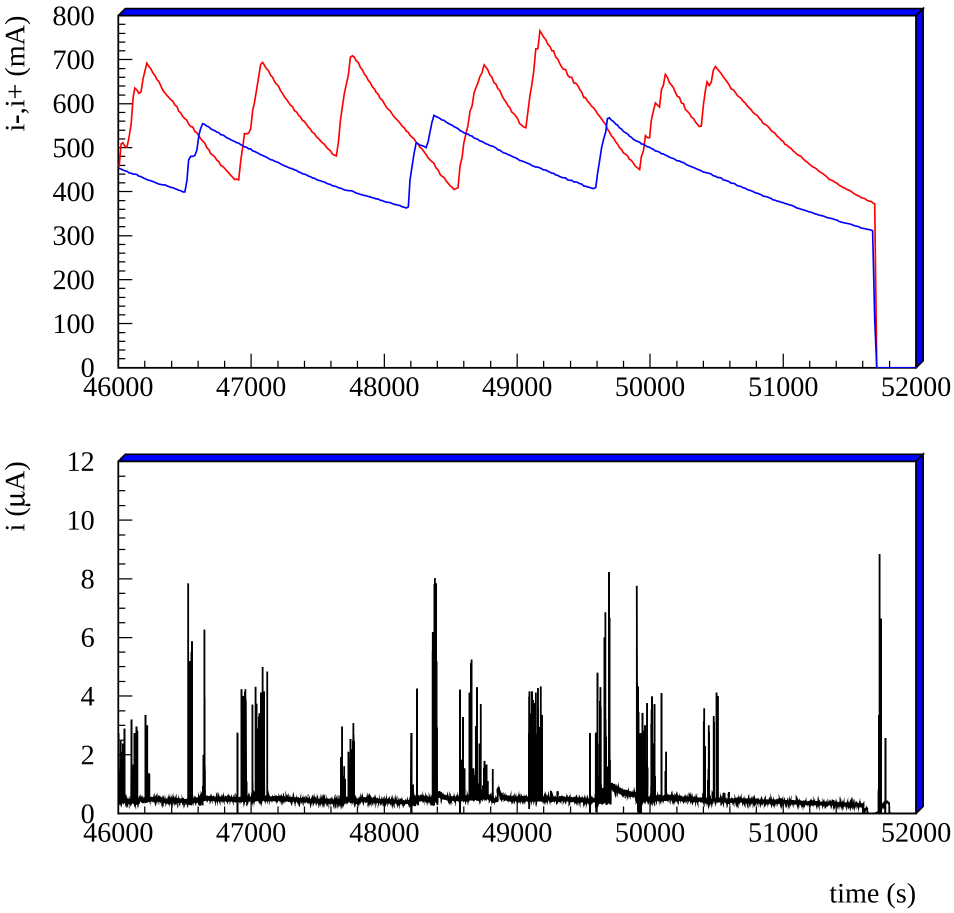
- HV: -100 V
  $\longrightarrow$ **gain** $\times$ **0.5**
  $\longrightarrow$ **HW** efficiency from **99.9** % to **99.0** %
- Trip threshold: from 2 to 3 μA (July)
- H_2O: 5000 ppm (September)



- This configuration allowed to leave the high voltage **ON** during injection

DC Integrated Charge

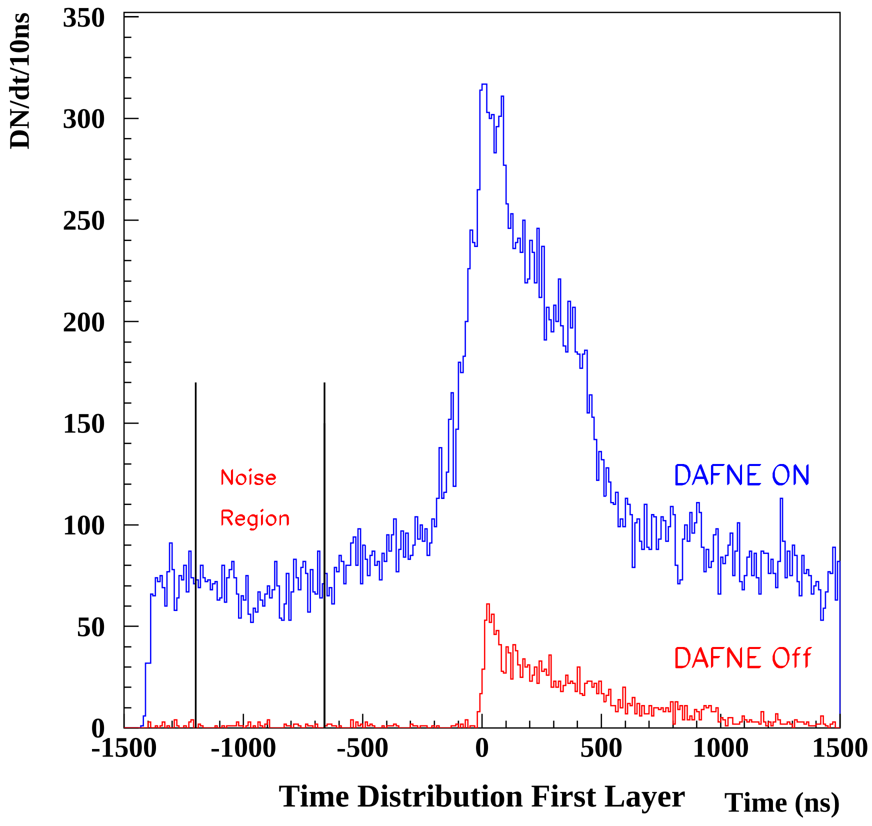
- The current drawn by all wires can be readout every **30 s**

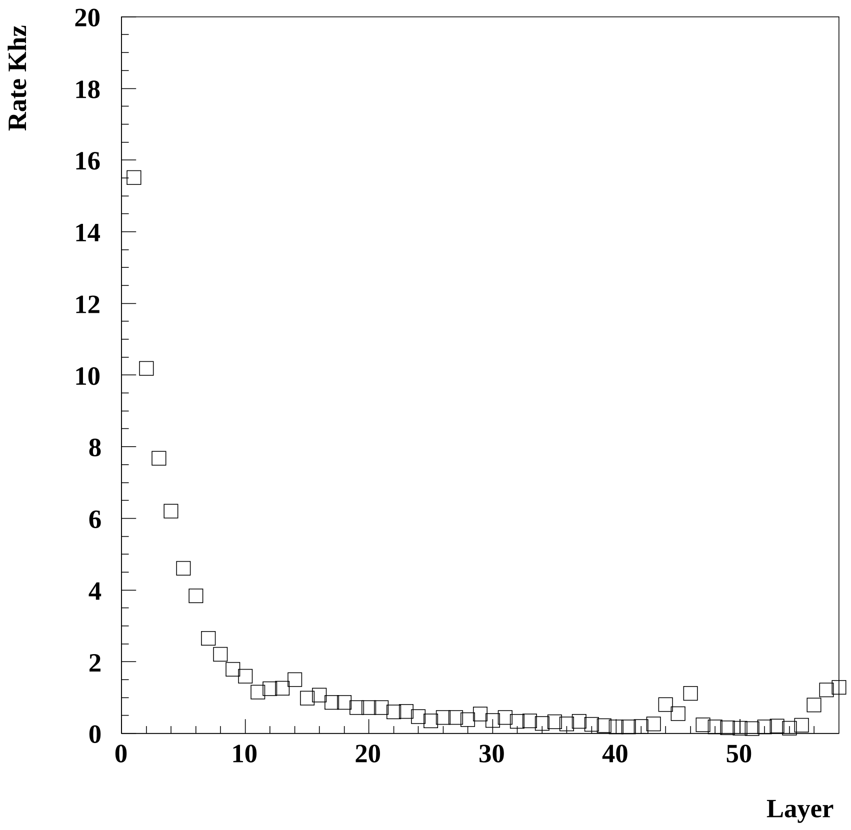


- The mean current measured by a nanoamperometer (sampling time 150 ms) on the inner layers, gives an integrated charge of

$$\sim 1 \frac{\mathrm{mC}}{\mathrm{cm} \times 100 \text{ days } \times \text{ wire}}$$

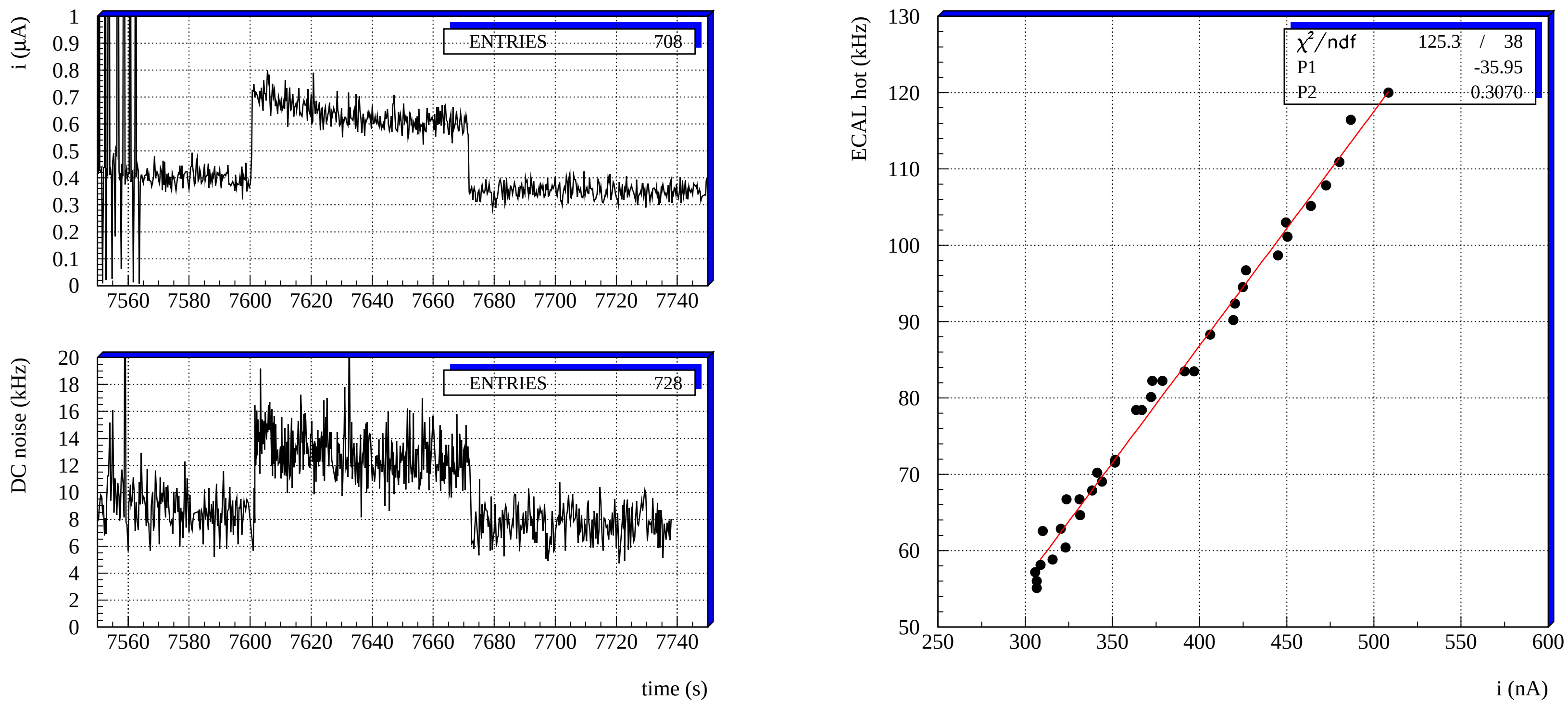
DC Single wire counting rate





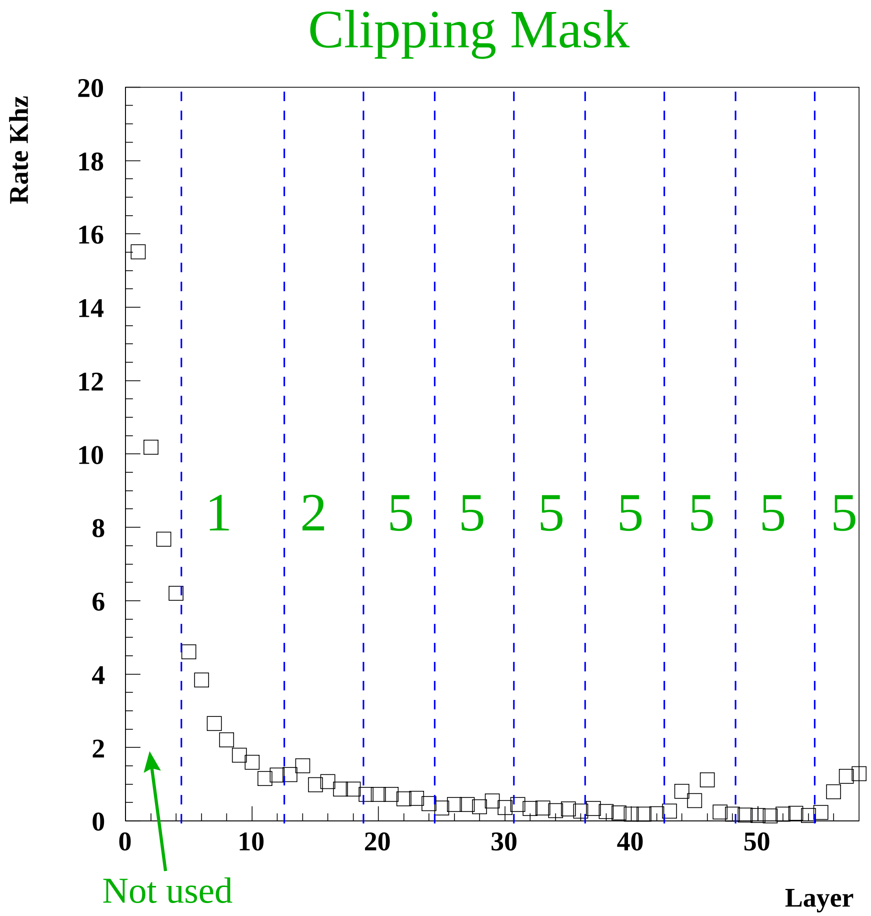
- In order to evaluate the rate of hits due to machine background the out-of-time hits are selected in a **200 ns** window
- The wire counting rate is calculated with an update time of **1.5 min**

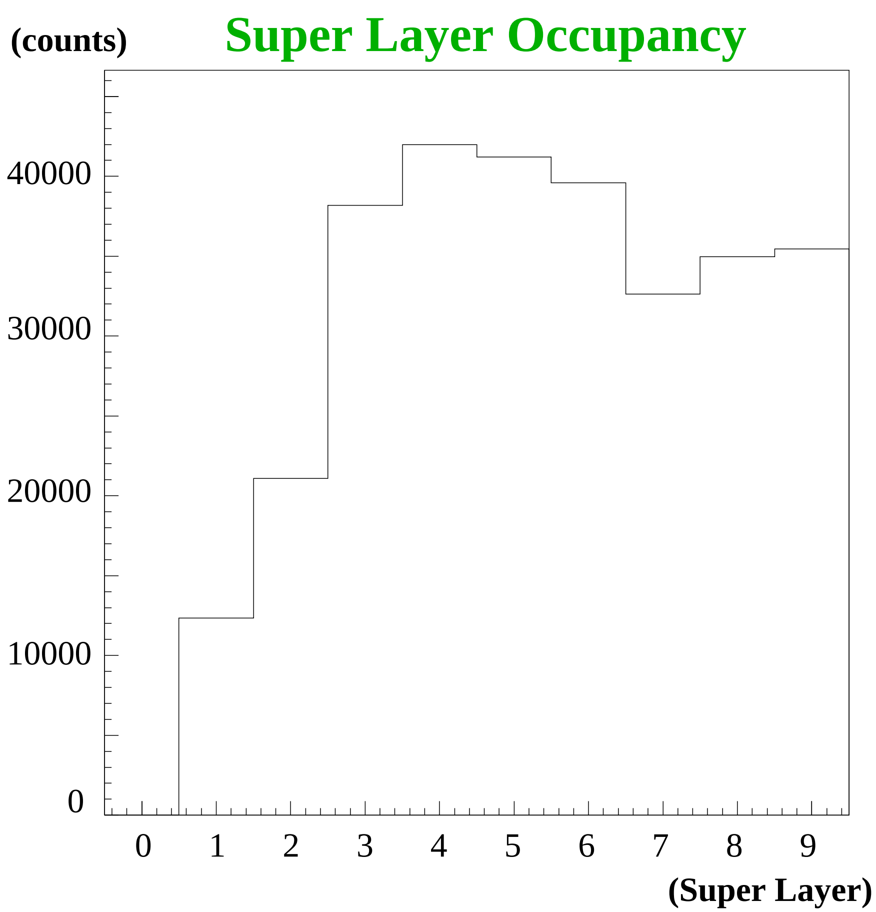
DC Online Monitoring



- The **correlation** between the currents measured by the nanoamperometer and the single wires rate is **very high**, as well as the one between the current and the endcap HOT rate.
- Limits are defined for a "safe" operation: DC noise $<$ **20 kHz** in the inner layers **AND** Endcap rate $<$ **80 kHz**

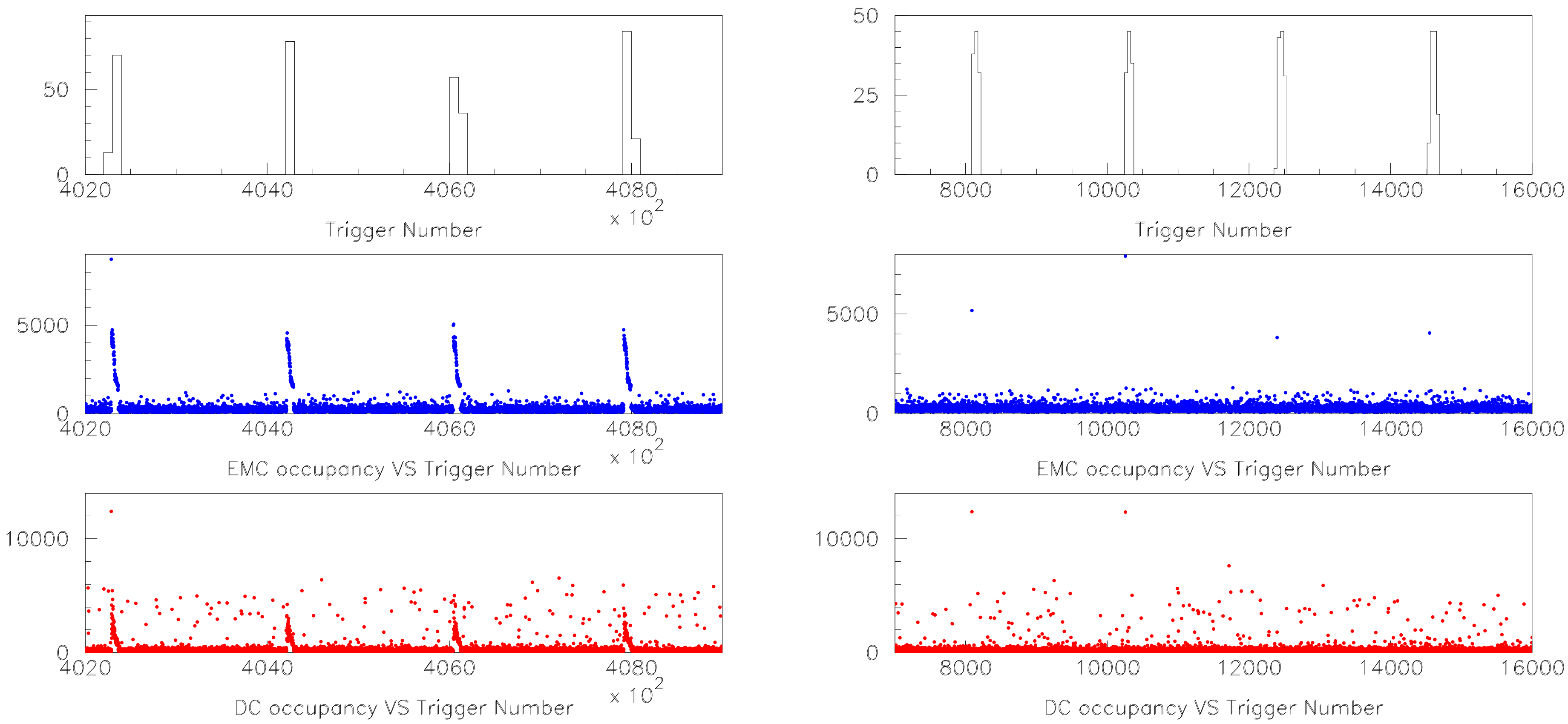
Background rejection with DC trigger





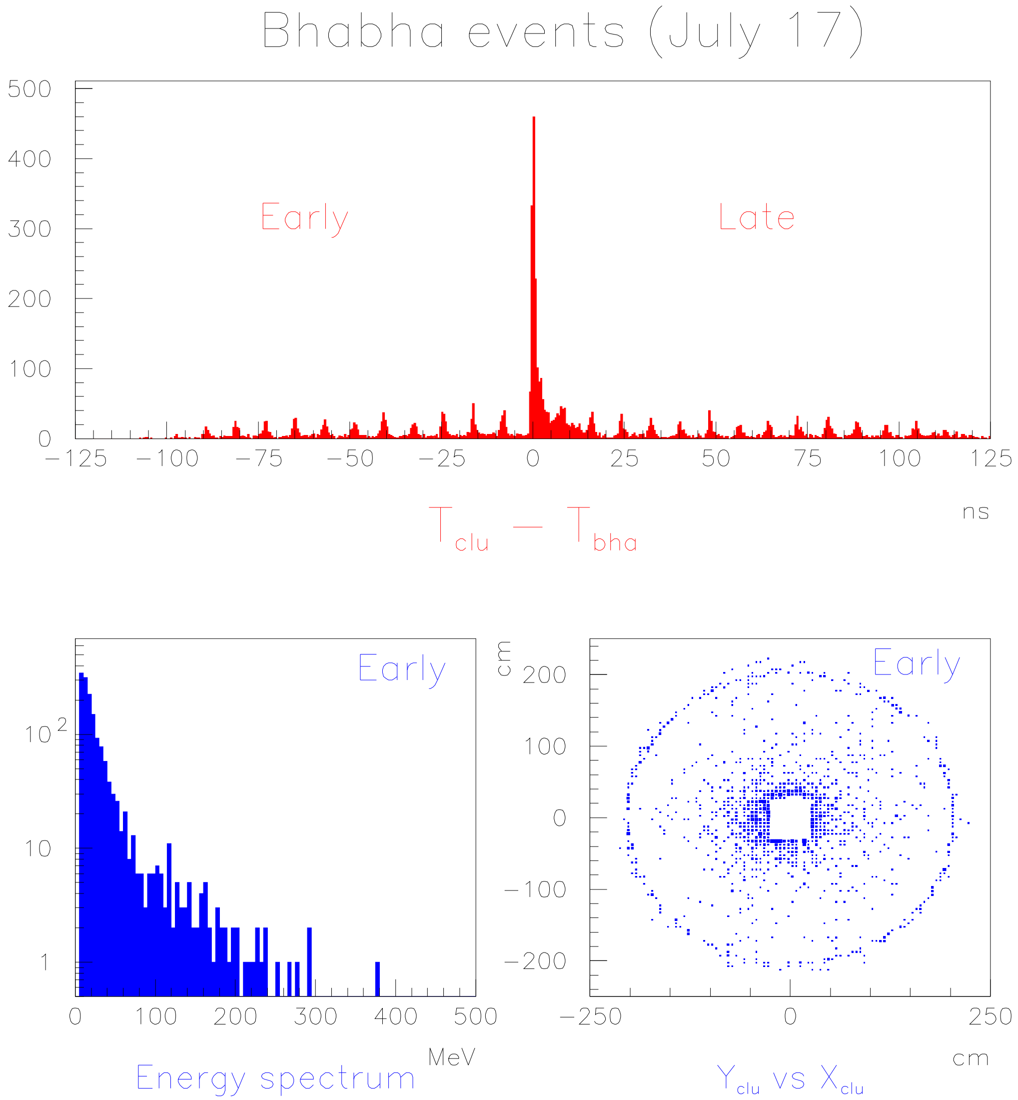
- Due to high bkg rates, an unbalanced **clipping** mask is applied to saturate the contribution of the innermost layers
- The request of **100** hits integrated in a window of 1.6 μs adds to the calorimeter trigger $\sim$ **1** kHz of events

Kloe DAQ during DaΦne Injection



- During Daϕne injection ($f_{INJ} = 1$ Hz) a 50 ms **busy** signal is sent to the DAQ in order to reject huge bkg events correlated with it.

Monitor of accidentals: data quality + background study

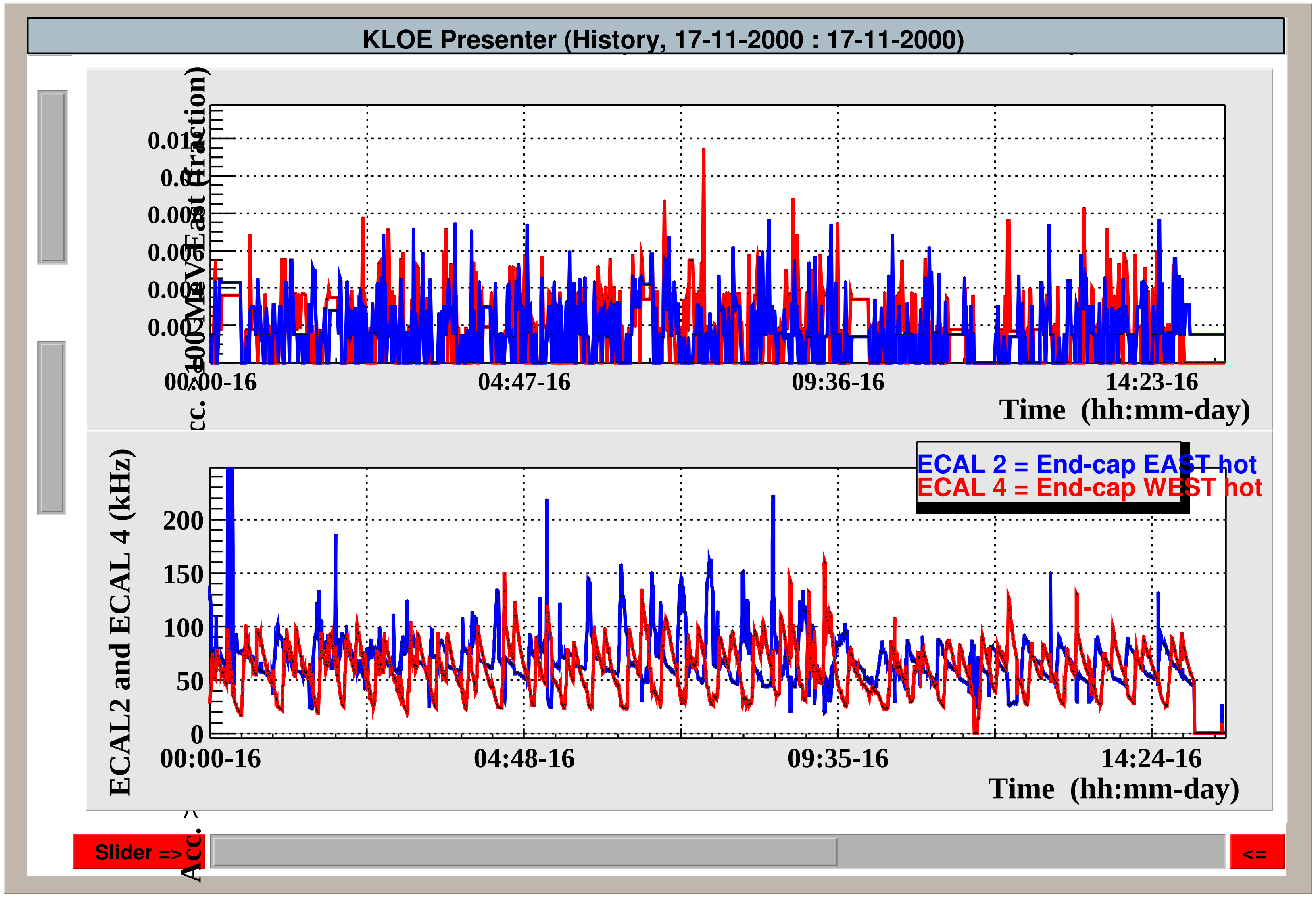


- Accidental clusters are selected in a early/late window (35 ns) around a **Bhabha** cluster, or in a **cosmic** event

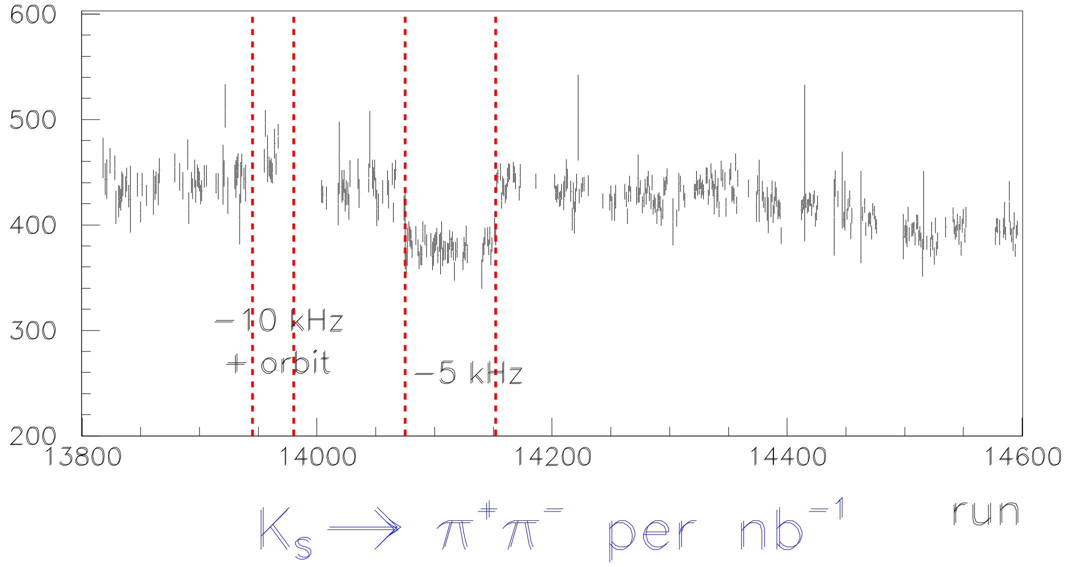
P(E > **7** MeV)	**6.5 %**
P(E > **100** MeV)	**0.5 %**
P(E > **50**; R_T > **60** cm)	**0.4 %**

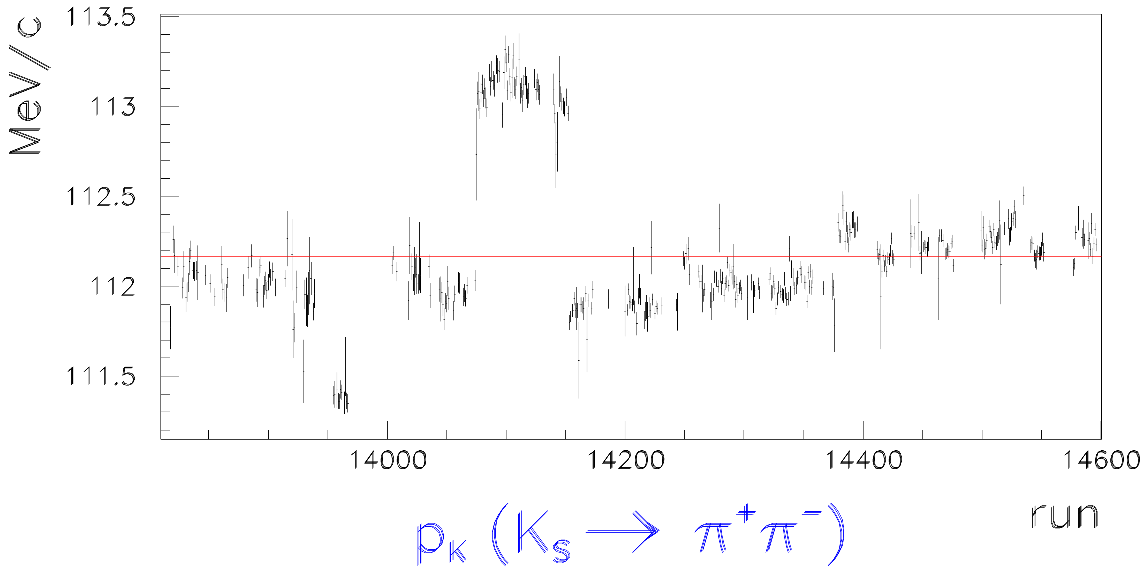
Monitor of accidentals (2)

- P(E > **100** MeV) $\sim$ 0.3% $\longrightarrow$ 0.03/35 ns^{-1} = 86 kHz $\longrightarrow$ **consistent** with endcap rate

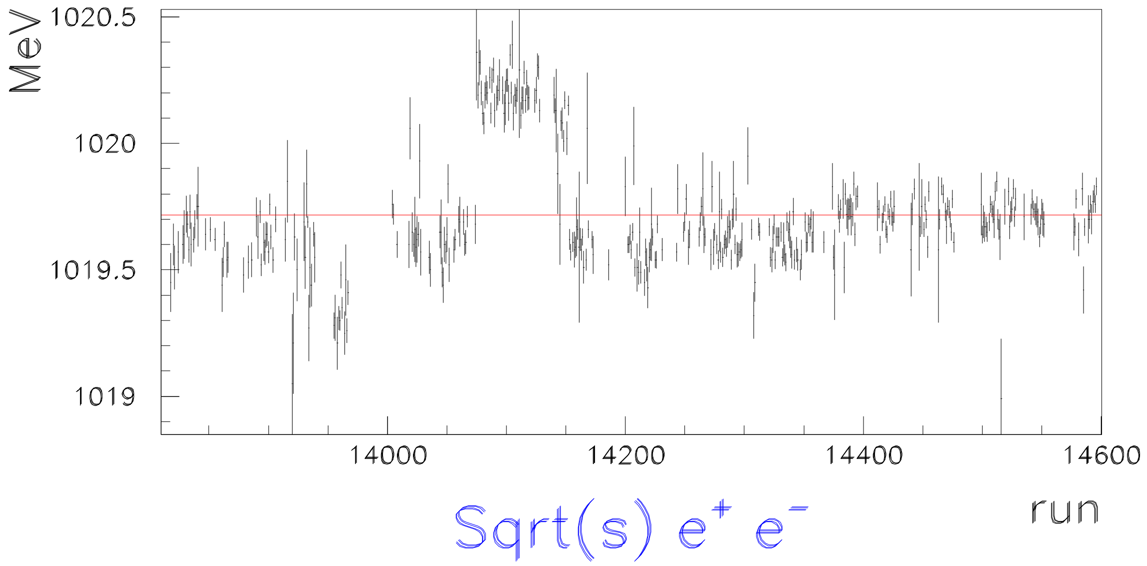


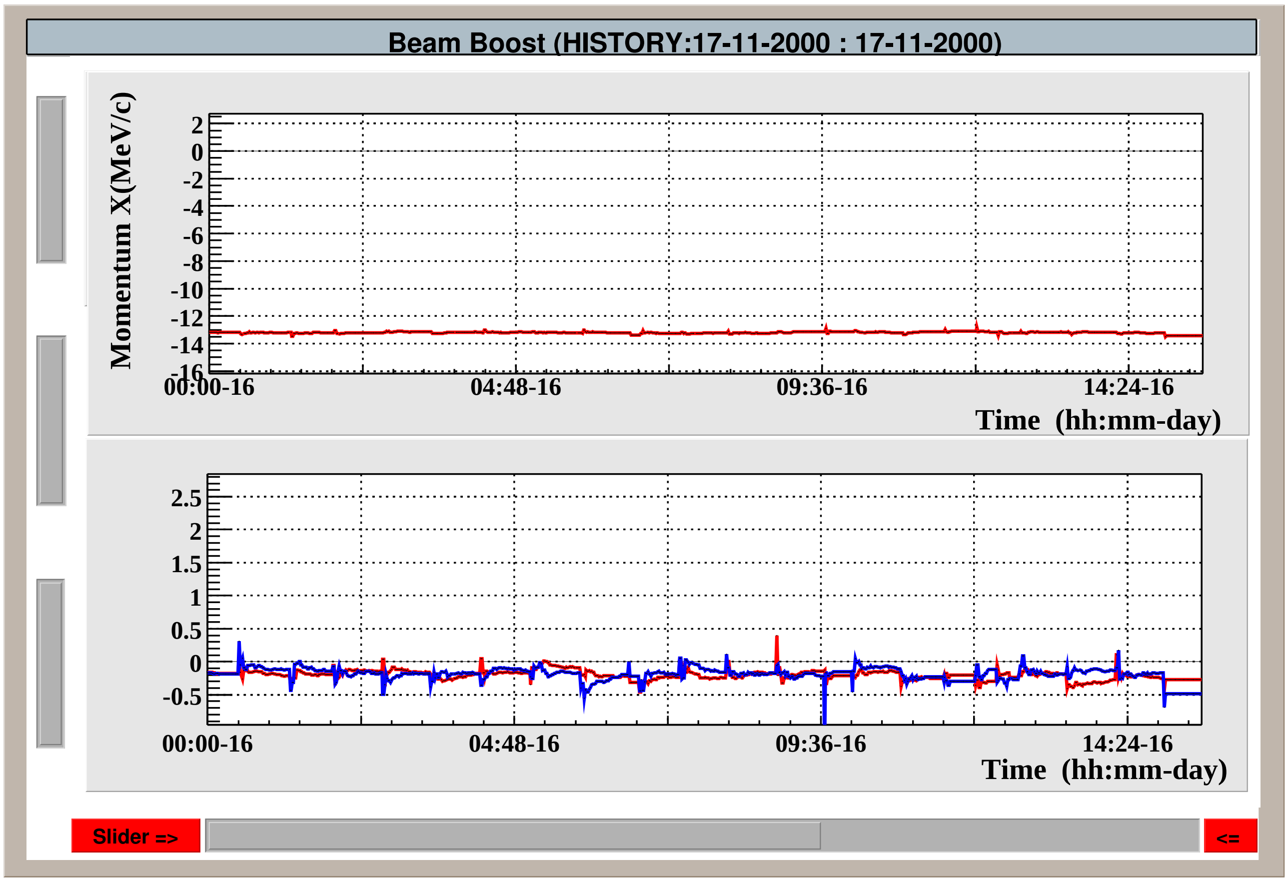
Machine energy monitor (offline)



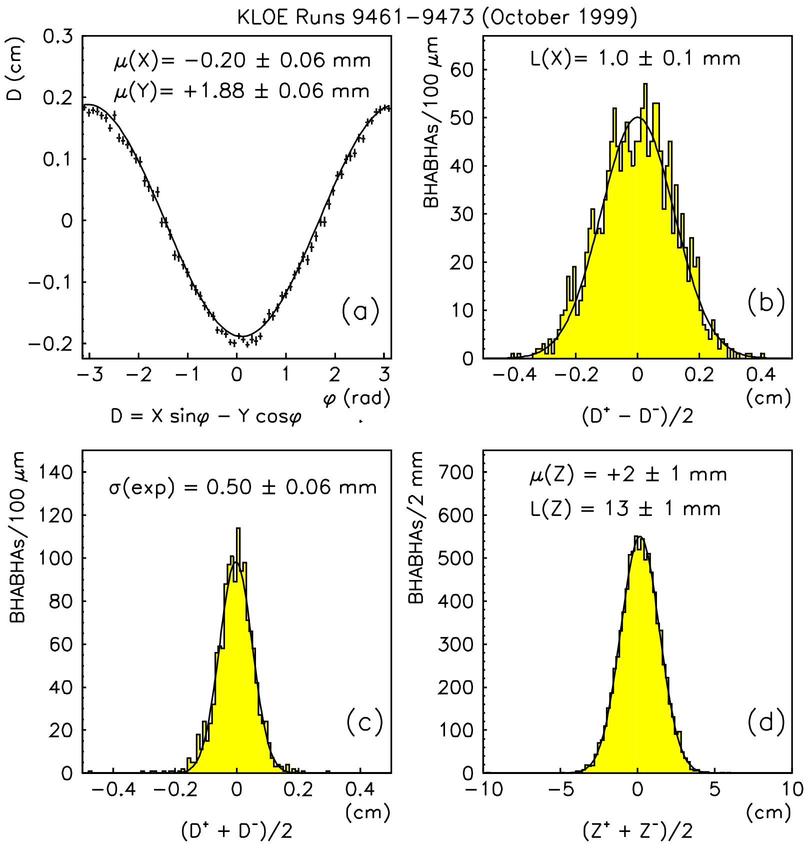


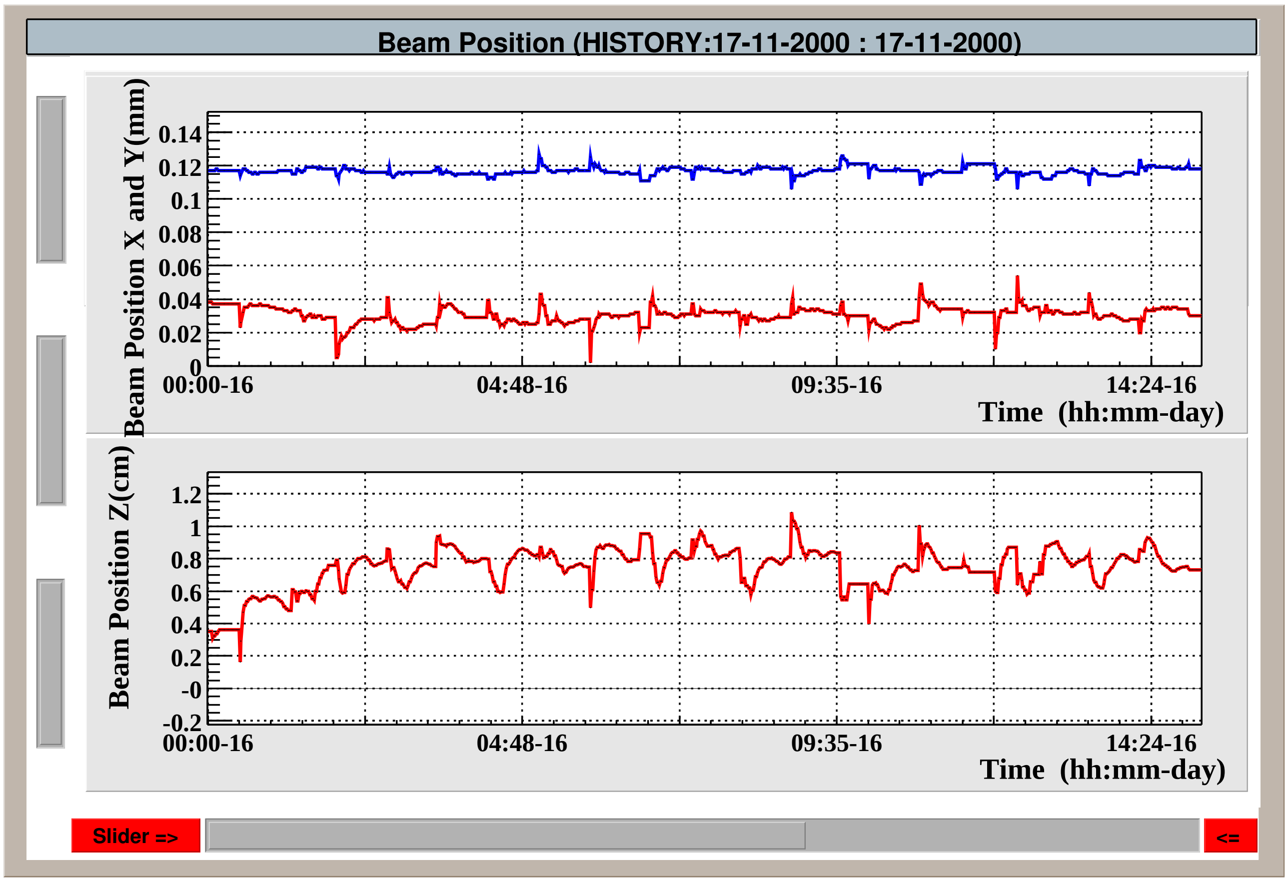
Machine energy monitor (online)





Luminous point (online)





Conclusions

1. Kloe detector worked smoothly in a critical bkg condition.
2. We are ready to take 10 - ... times more integrated luminosity, but we cannot stand a higher level of background.
3. Kloe can monitor continuously the machine behaviour and give feedback to accelerator physicists.
4. DaΦne and Kloe groups worked very hard in a strong and fruitful collaboration; we hope this will give in future more and more data.