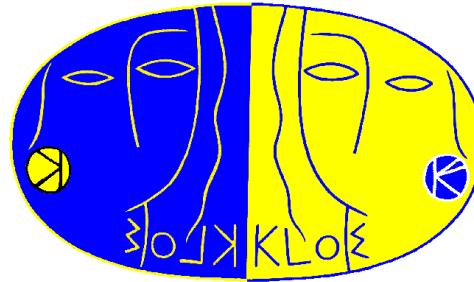

Achim G. Denig
(IEKP)

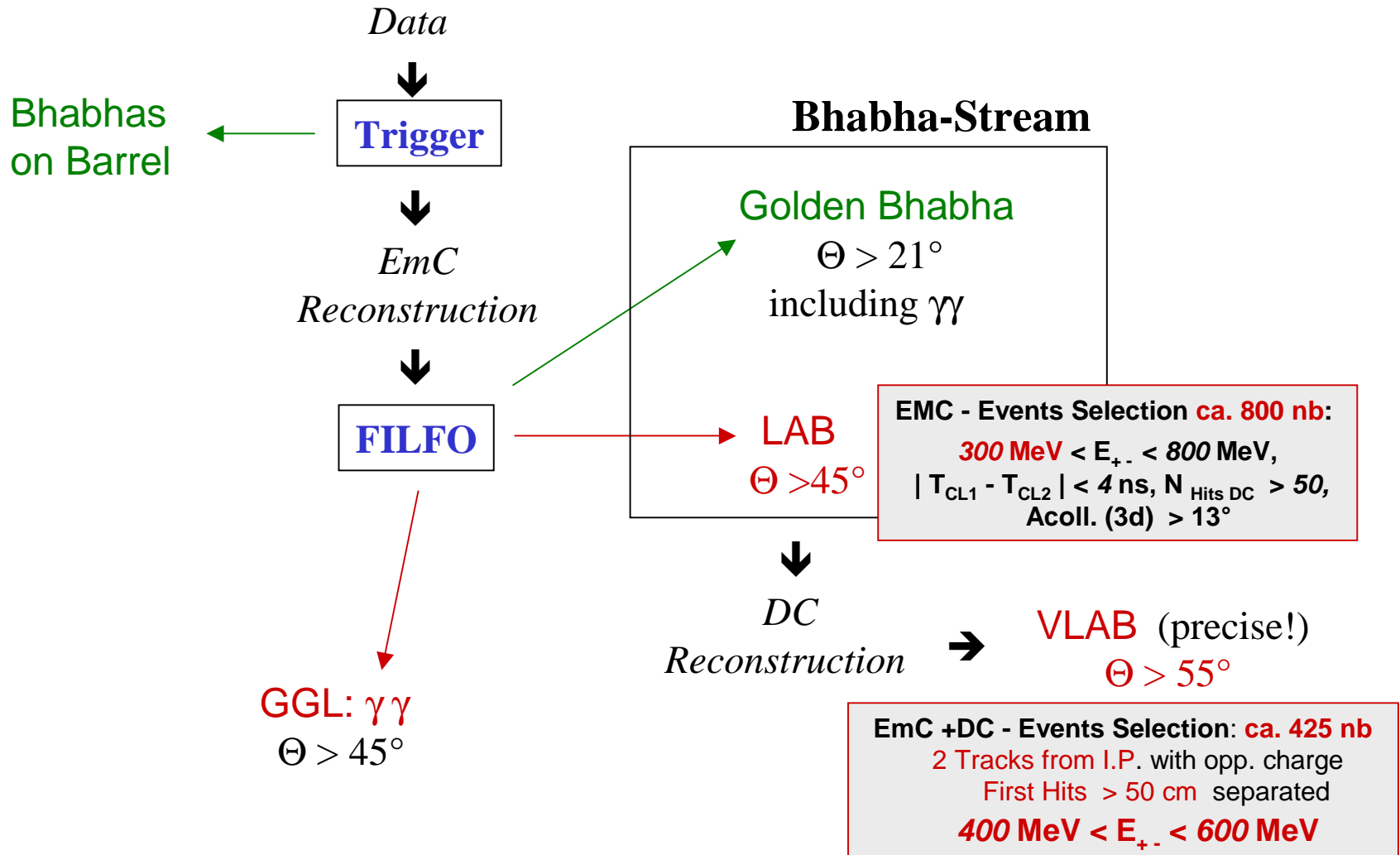
KLOE General Meeting
Roma 2, 19. Dec. 2002



(V)LAB Systematics

..... and M.Bkg. monitoring

Luminosity Counters



Systematics

The luminosity is given by: $L = N / \sigma_{\text{EFF}}$ where σ_{EFF} is the theoretical cross section evaluated from MC including the **efficiencies** and the **detector smearing**

The **systematics** of the measurement are given by :

MC-Data difference in:

- 1) Acceptance
- 2) Efficiency
- 3) Background contamination



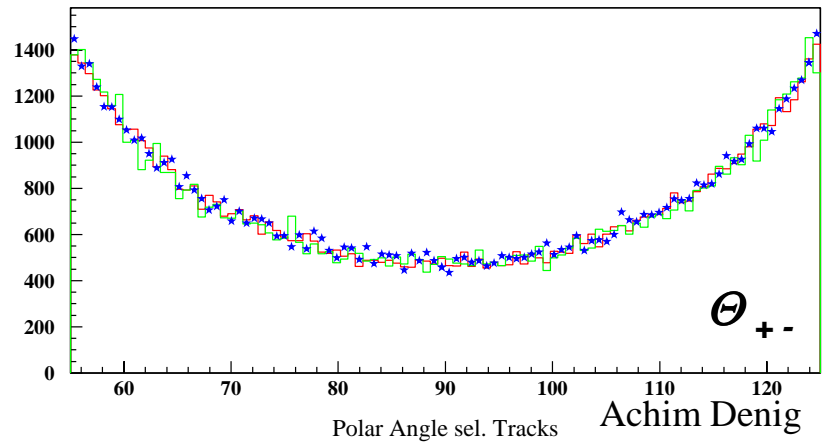
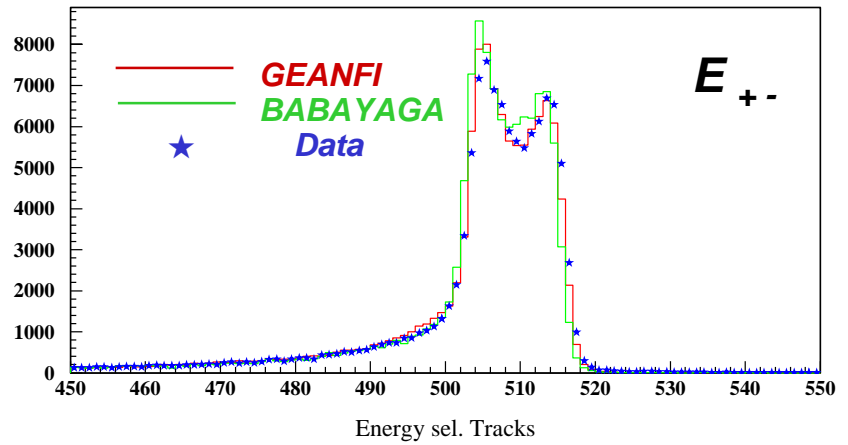
*Has been studied in the past for selected Runs:
MC and Data distributions agree very well
Systematic Effect due to Accep. Cuts <1% level*

**Variations in time due to
Running Conditions:**

\sqrt{s} , p_{ϕ} Beam position not const.
EmC - Calibration (DC?)
Misalignment
Machine Background



Monitoring Tool: *BVLAB*



BVLAB

→ a modification to the standard VLAB - Module which allows to:

store **Histograms** of relevant distributions

- concerning the **M.Bkg. in LAB- and GGL-events** “file-by-file” (**Background-VLAB**)
- concerning the **VLAB - Systematics** “run-by-run”

VLAB

- Polar Angle Distributions LAB / VLAB
- Accolinearity Distributions
- Energy Distributions EmC – Clusters
- Momentum Distributions Tracks
- Efficiencies
- many others

Machine Background

- Number of non-assoc.-Hits to DC-Tracks
- Number of EmC-Clusters
- Energy of EmC-Clusters
- Accidental Rate EmC
- Accidental Rate QCAL

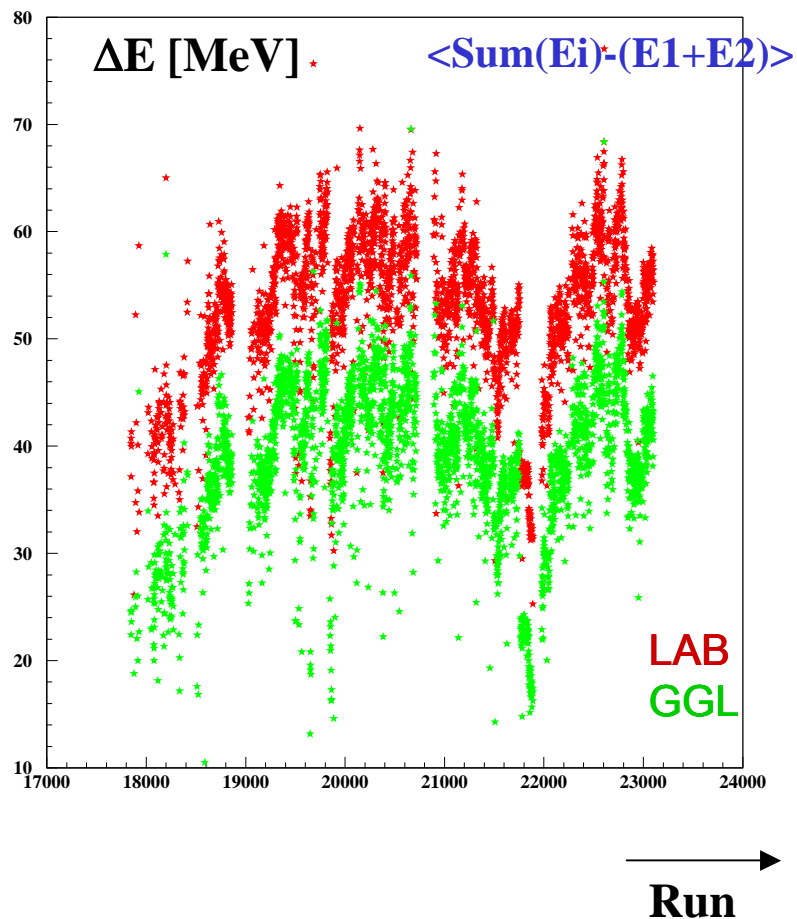
Machine Parameters

- sqrt(s)
- px, py, pz

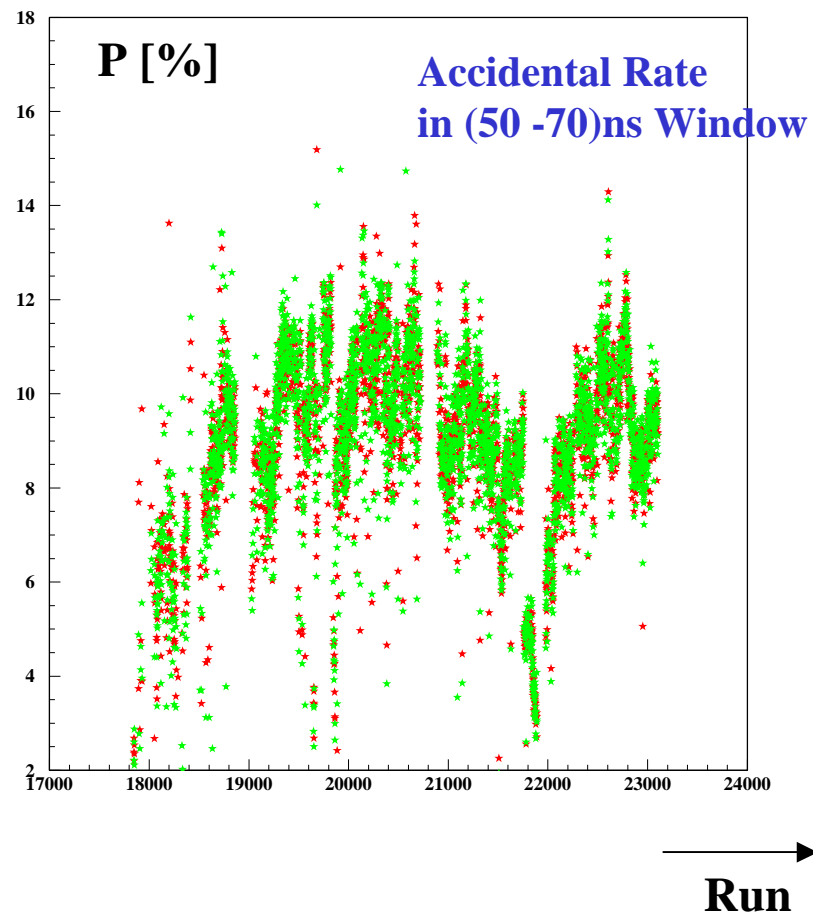
→ In 08/02 **the entire Bhabha-Stream of 2001 data** (ca. 3000 Runs) has been analyzed by BVLAB-Module (ca. 2 weeks running time on 3 CPU's)

Machine Background

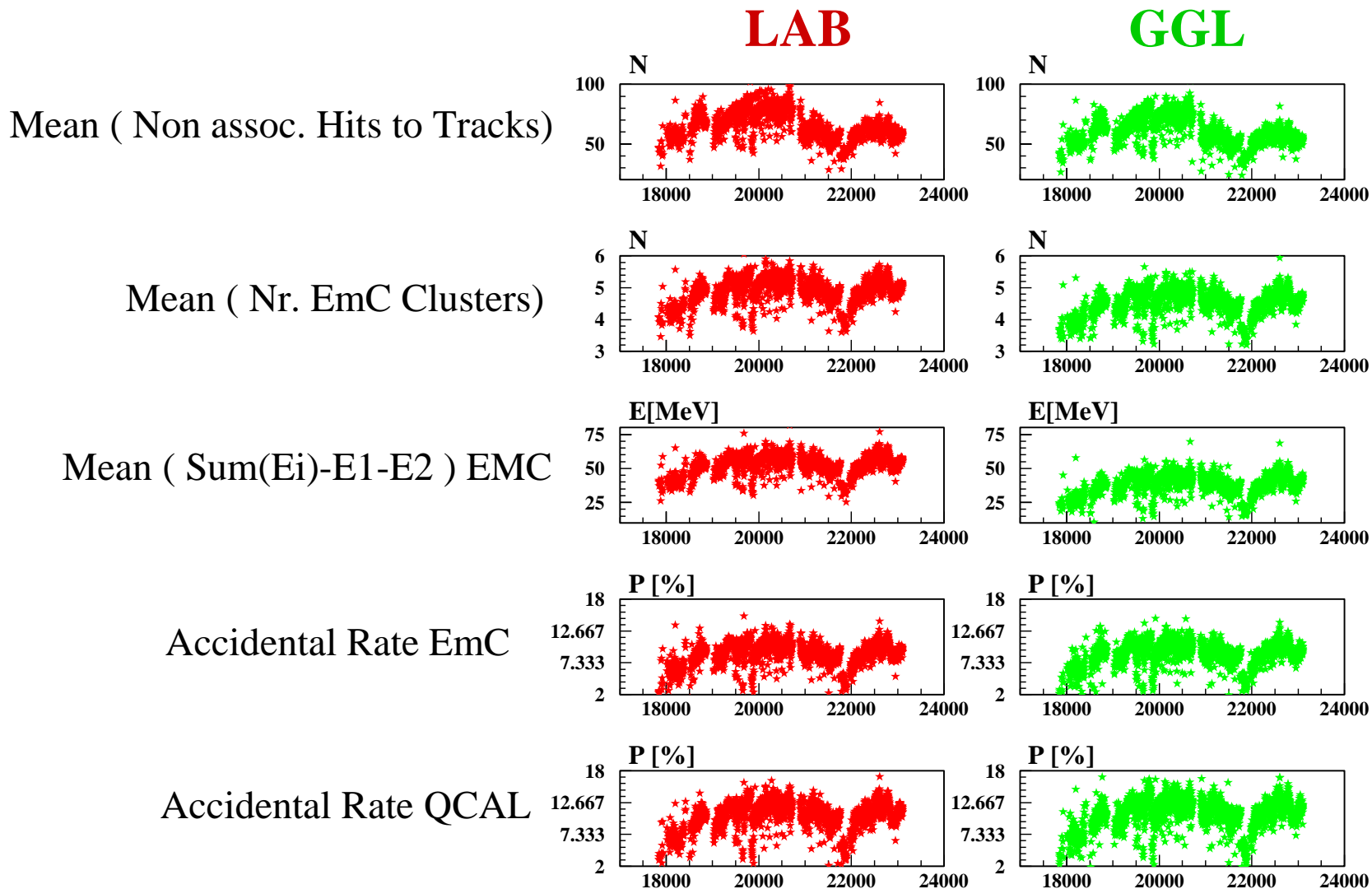
From Energy Distr. in EmC



From Time Distr. Clusters EmC



Machine Background



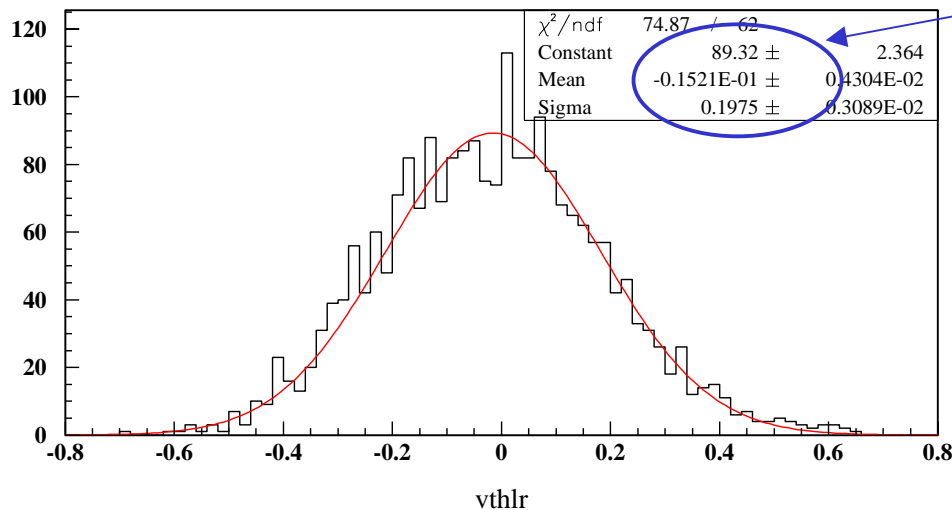
BVLAB - Systematics

- In the following I will show some results from the **analysis of the BVLAB-Histograms** (2001 data) and a **comparison with MC**
- **Polar Angle Cut** (EmC - Clusters) relevant for LAB and VLAB
 - **Energy Cut** (LAB: Clusters, VLAB: DC-Momentum)
 - **Efficiencies** (Cluster, Tracking)
- I take into account **only runs with $> 35\text{nb}^{-1}$** integrated Luminosity in order to have enough statistics in one run :
- $35\text{nb}^{-1} = 28.000$ LAB-Events (ca. 0.6% stat. Error)
 $= 15.000$ VLAB-Events (ca. 0.8% stat. Error)

Polar Angle

$$\frac{N(55^\circ - 90^\circ) - N(90^\circ - 125^\circ)}{N(55^\circ - 90^\circ) + N(90^\circ - 125^\circ)}$$

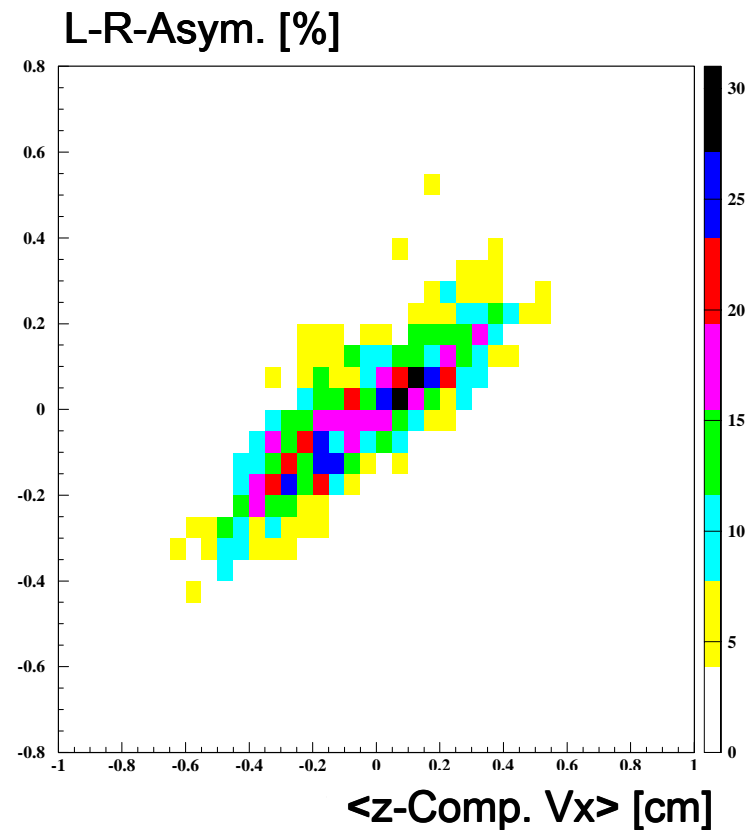
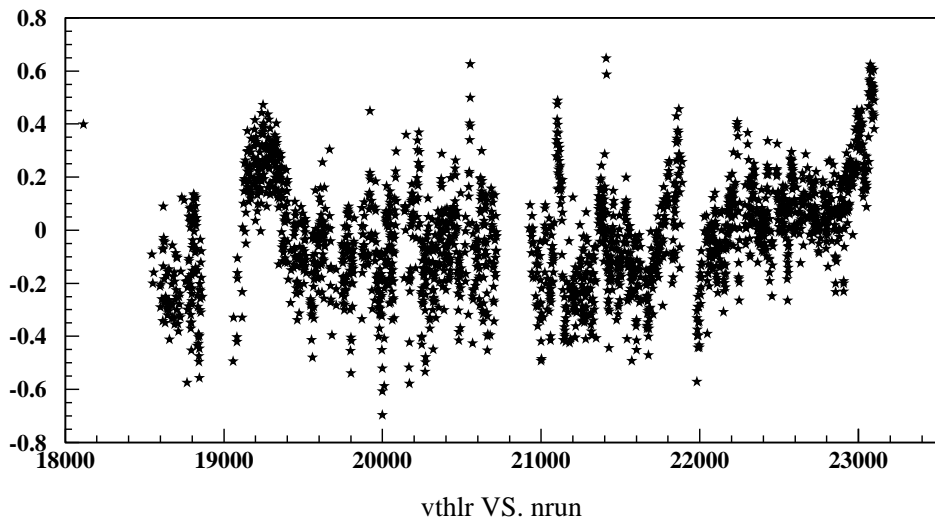
Left – Right - Asymmetry (VLAB)



Sigma = 0.2% L-R-Asymmetry

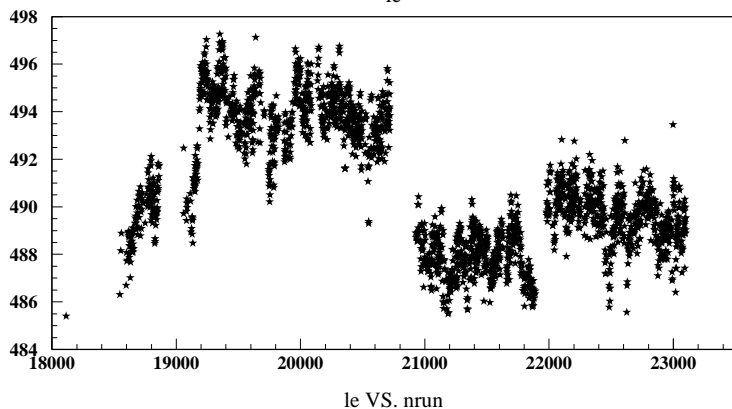
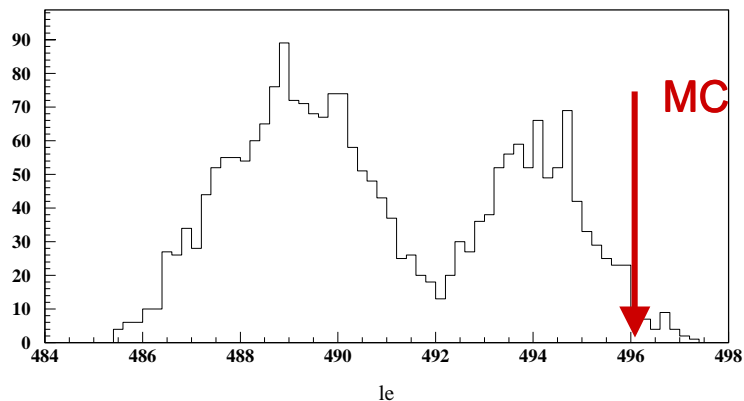
1% L-R-Asymmetry: $\delta L / L < 0.1 \%$

→ Polar Angle Cut “save”



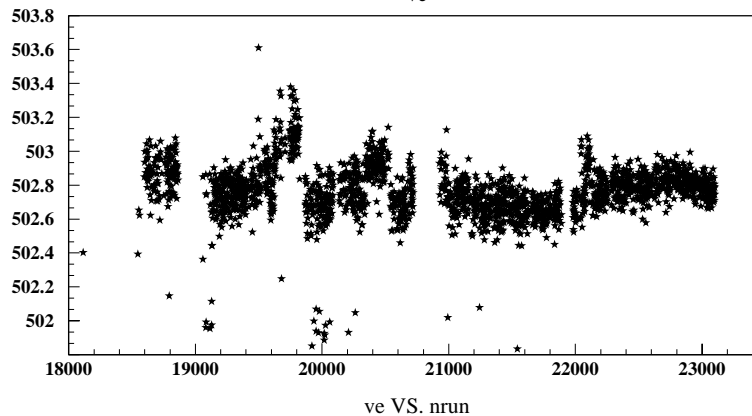
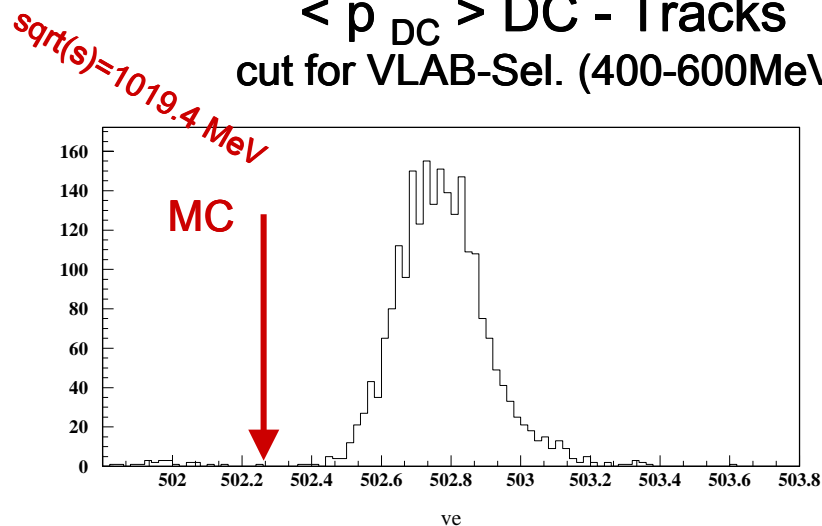
Energy

$\langle E_{EmC} \rangle$ EmC - Clusters
cut for LAB-SEL. (300-800MeV)



Difference Data - MC up to ca. 5 MeV!
This is causing some syst. effect:
 $\delta L/L = 0.2\%$ (correction needed?)

$\langle p_{DC} \rangle$ DC - Tracks
cut for VLAB-SEL. (400-600MeV)

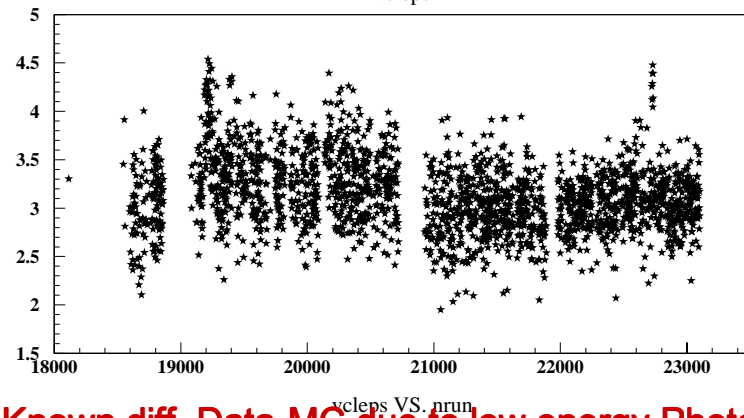
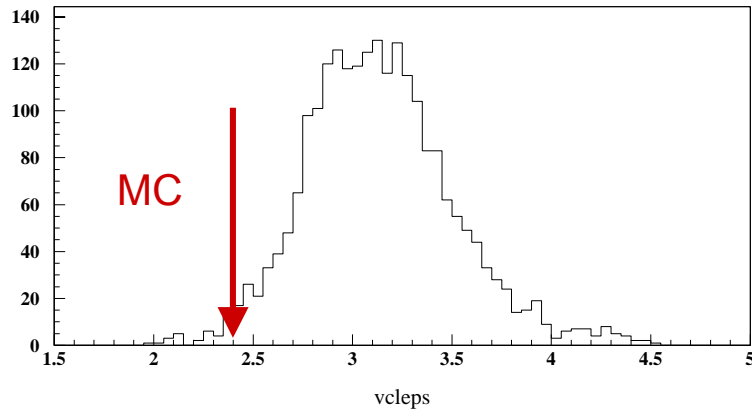


Negligible effect on $\delta L/L$

Efficiency

Cluster Inefficiency

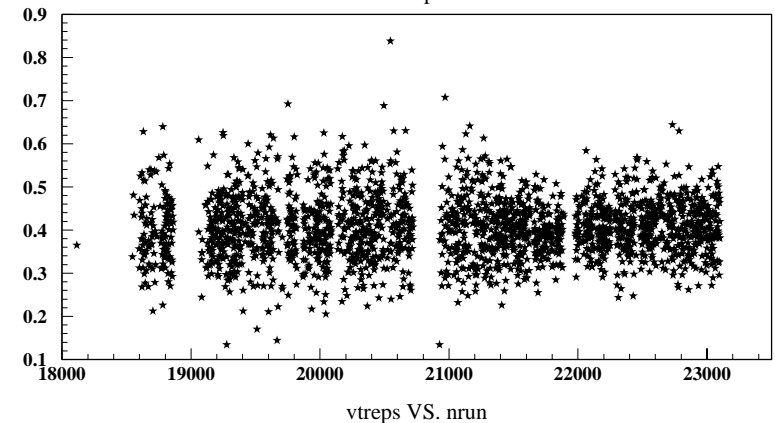
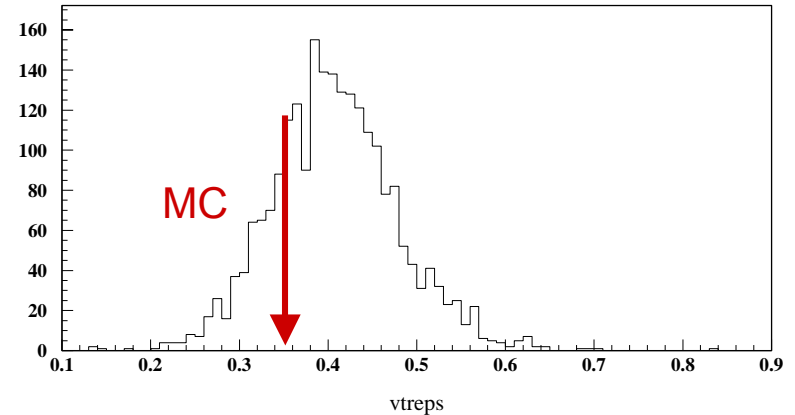
from radiative Bhabhas, $E_{\text{miss}} > 20\text{MeV}$:



Known diff. Data-MC due to low energy Photons;
for $E_{\text{Cl}} > 300\text{MeV}$ agreement has to be checked!
However no big fluctuations with time!

“Tracking Inefficiency”:

taking 2-Cluster-Ev. With 1 Track only



Tracking good up to 0.1%

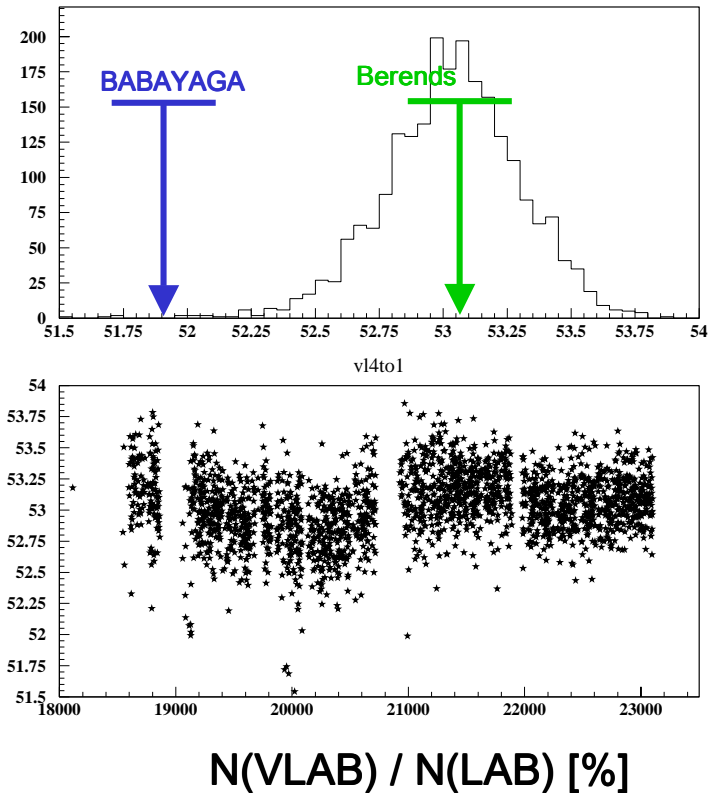
Effective Cross Sections

- In 08/02 a large MC production for Bhabhas has been performed :
 5.000.000 Events with Berends et.al. Generator $20^\circ < \Theta_{e^-} < 160^\circ$
 5.000.000 Events with BABAYAGA 3.0 – Generator

- Results
 for new effective cross-sections:

nb	Berends	BABAYAGA
LAB	809.9 ± 3	828.0 ± 3
VLAB	428.1 ± 2	430.1 ± 2

Problem with LAB with BABAYAGA3.0 ?!
 In 2000 the 2 generators had been found
 in very good agreement (diff. < 0.5%) !?



Summary & Outlook

- We have developed a **monitoring tool (called BVLAB)** to study:
 - the **level of Machine Background** in LAB- and GGL-events
 - the dependence of running conditions on the **VLAB - systematics**
- The analysis of this monitoring tool is in an advanced state; the individual contributions to the error are on the level of few permille
We do not find a limitation for a VLAB-precision < 1%

Very few runs of 2001 data show a non-standard behavior; they might be excluded from the run list

- **Final systematic error** will be calculated when **all cross checks** have been finished (e.g. VLAB vs. GGL, VLAB vs. GBH, VLAB vs. TRG).