Introduction

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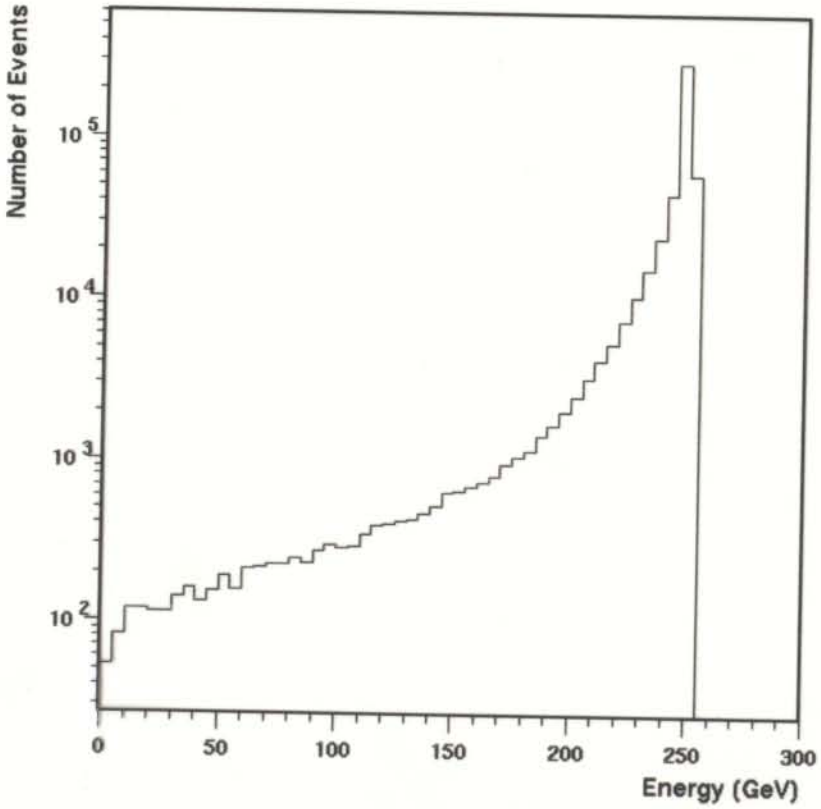
Goal: Check if the true luminosity spectrum can be obtained from Bhabha processes using the forward calorimetry by the employment of unfolding techniques.



$$\sigma_{e^+e^-}(5.4\,mrad < \theta < 83.1\,mrad) \approx 160\,000\ pb$$
$$for\ \sqrt{S} = 500\ GeV$$

Technique

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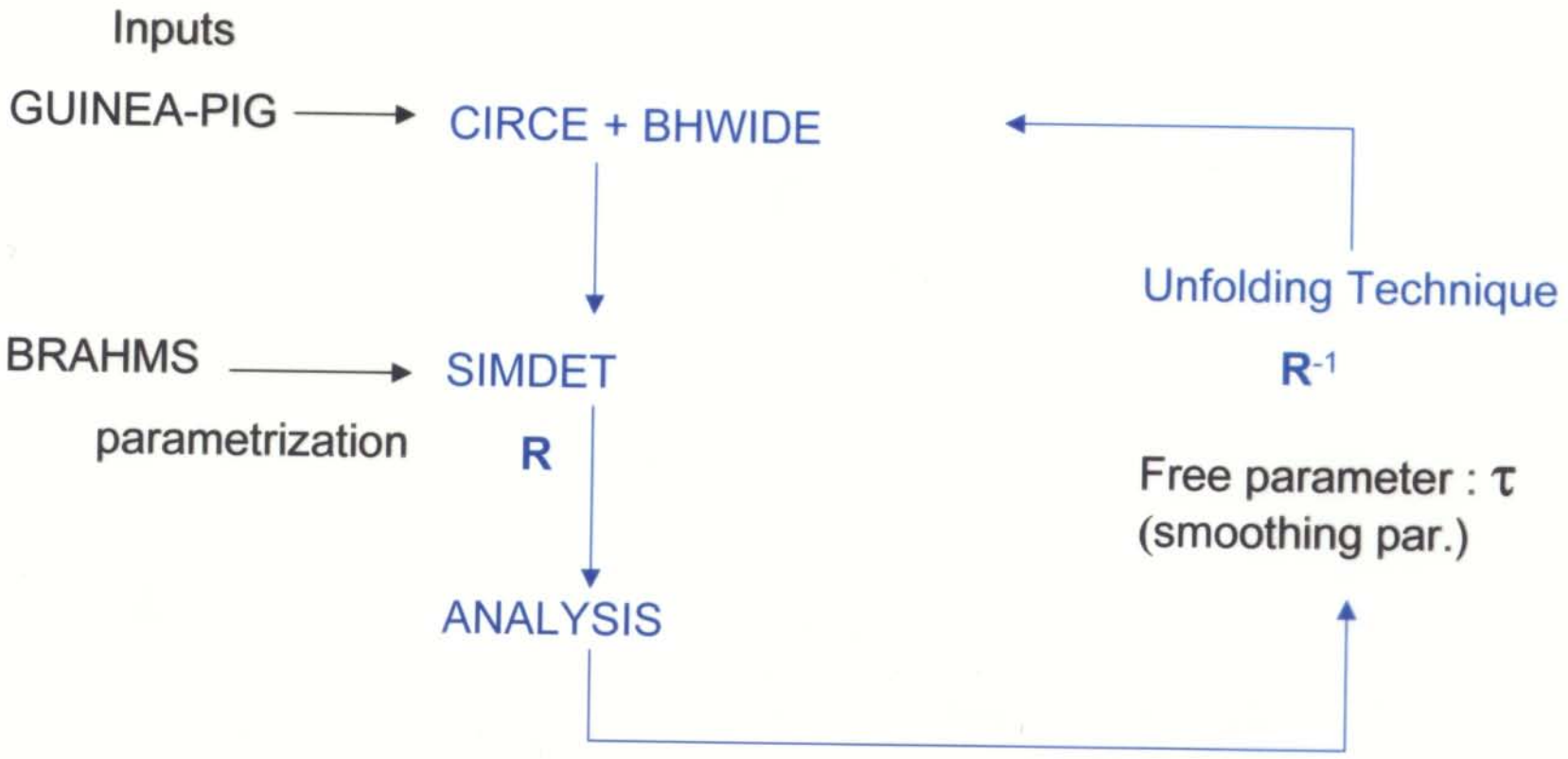
Unfolding techniques using the transformation matrix of a detector for associated variables (Energies, angles,…) can be used. There are some packages such as GURU/ RUN.



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Need of This Technique

Response matrix of a detector which requires precise parameterization.

For forward calorimetry(LCAL/LAT) parametrization is under way (W. Lohmann *et al.*) with and without background and is being included in SIMDET.

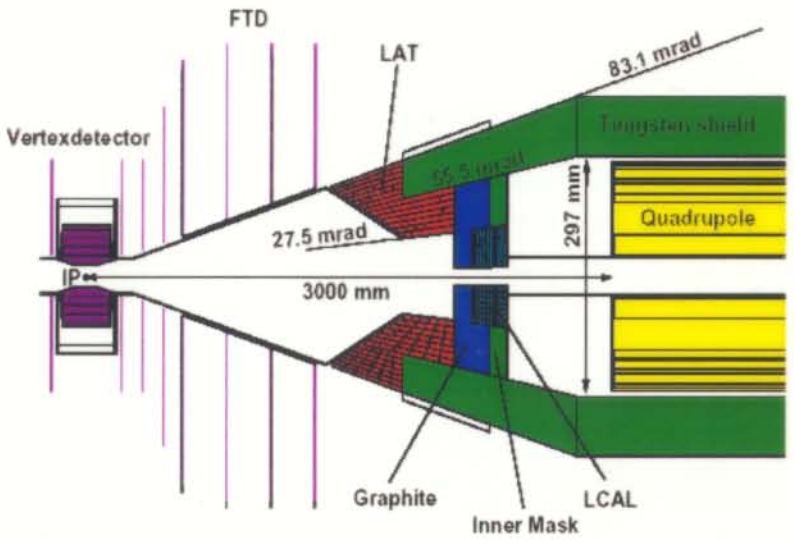
Energy resolution of calorimeter described as quadratic addition:

$$\frac{\sigma_E}{E} = \sqrt{\left(\frac{a}{\sqrt{E}}\right)^2 + b^2}$$

a: stochastic term

b: constant term

LAT (from TDR updated)
a=0.1
b=0.01
θ_{min} = 27.5 mrac
θ_{max}= 83.1 mrac



LCAL (updated to paramet.)

A and b as in the following slide, dependant on θ
θ_{min} = 5.4 mrad
θ_{max}= 30 mrad

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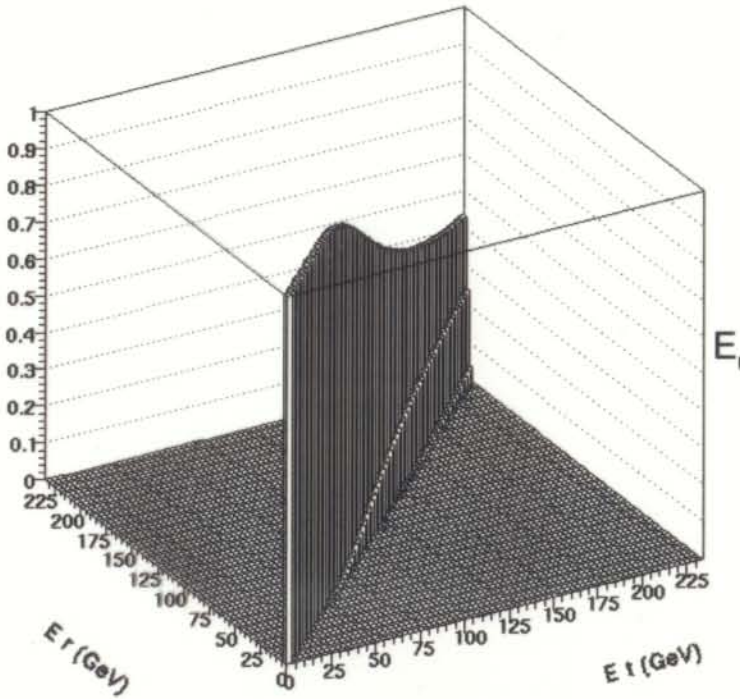
Parametrization & Matrix

2 examples for unfolding:

LCAL Parametrization of energy (preliminary),

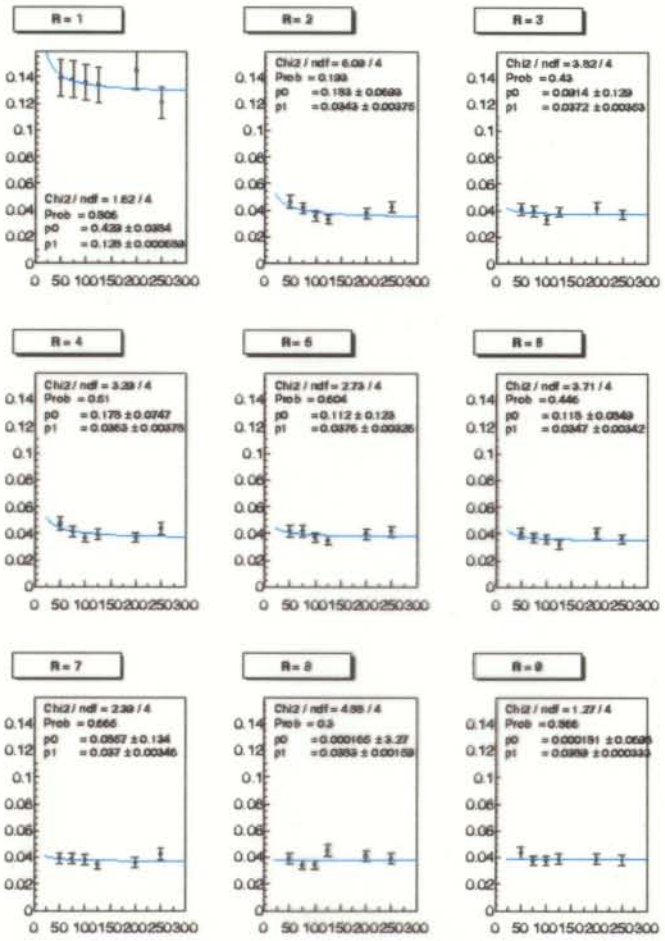
LAT Matrix of considered variables

LAT matrix (R) from TDR



$E_{reconstruction}$ vs E_{true}

LCAL parameterization (k. kuznetsova)



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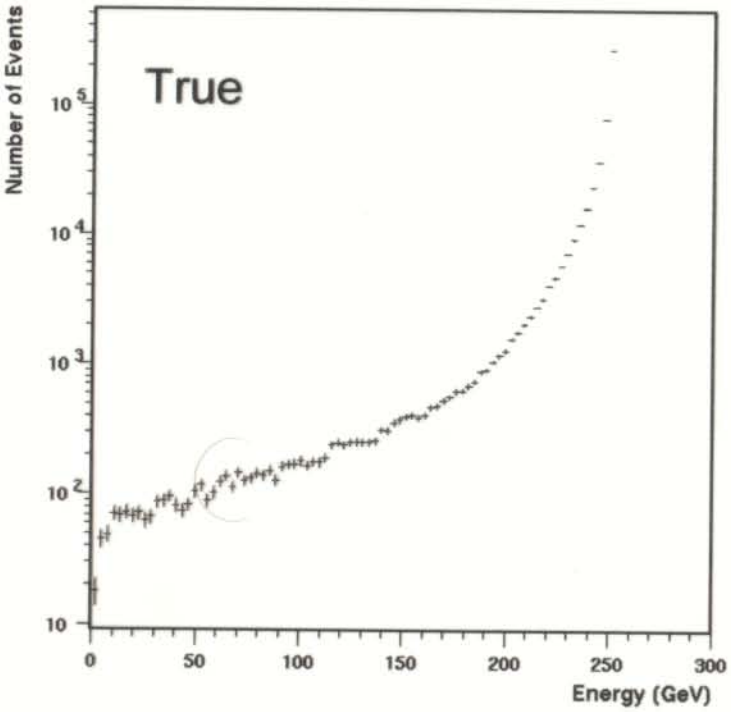
Unfolding with LAT

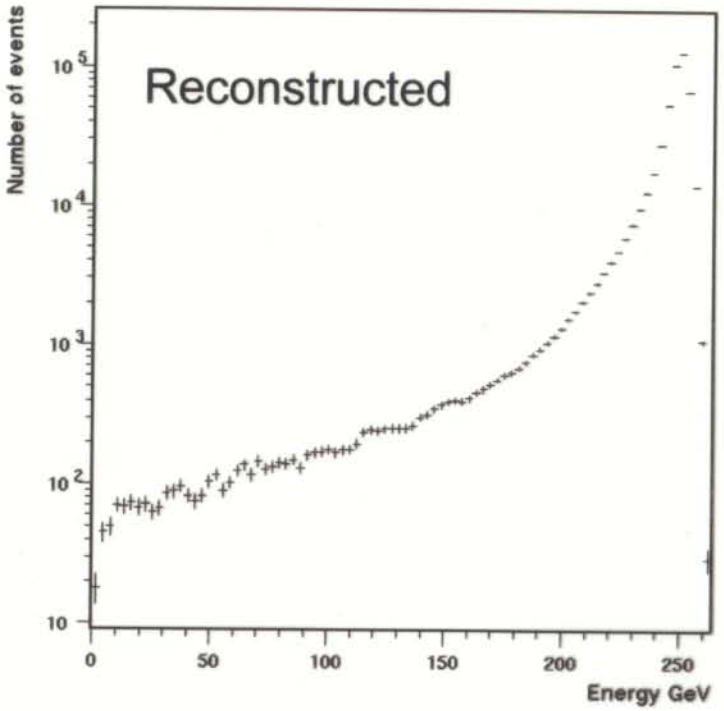
Lower statistic than LCAL (30 times),
Better resolution,
Less background.

True distribution from CIRCE 1.0
+ BHWIDE 1.04

Integrated luminosity: 2.5 fb^{-1} at $\sqrt{S} = 500\,GeV$

Beamstrahlung + ISR included





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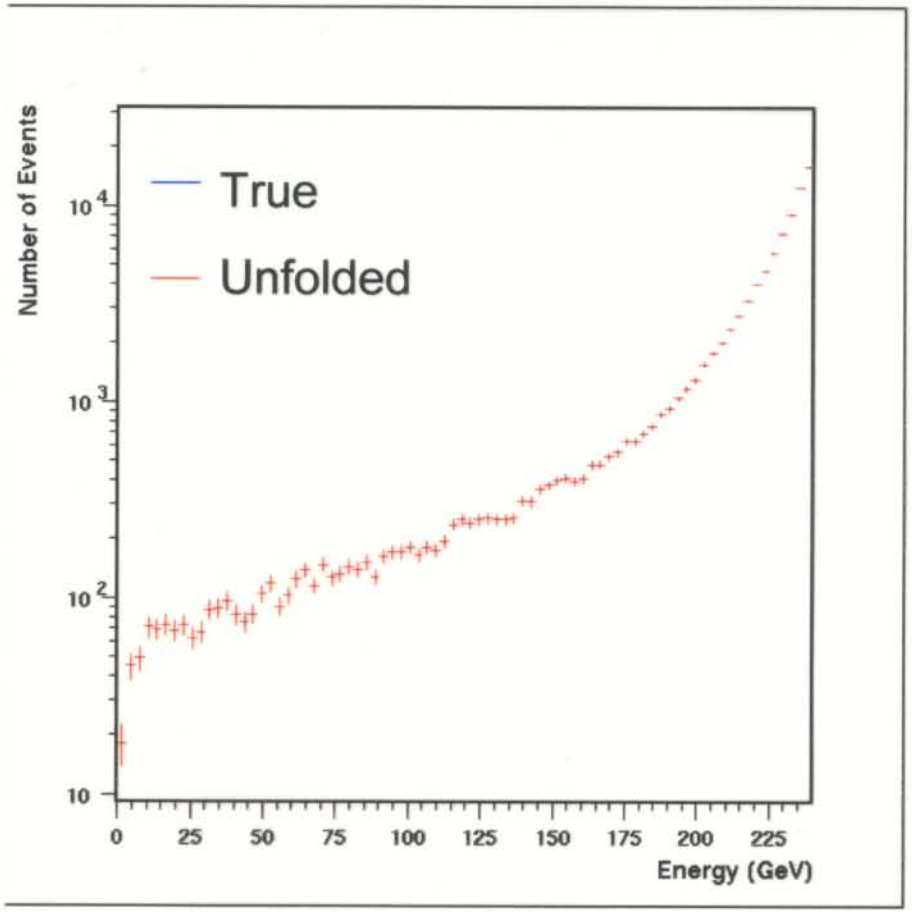
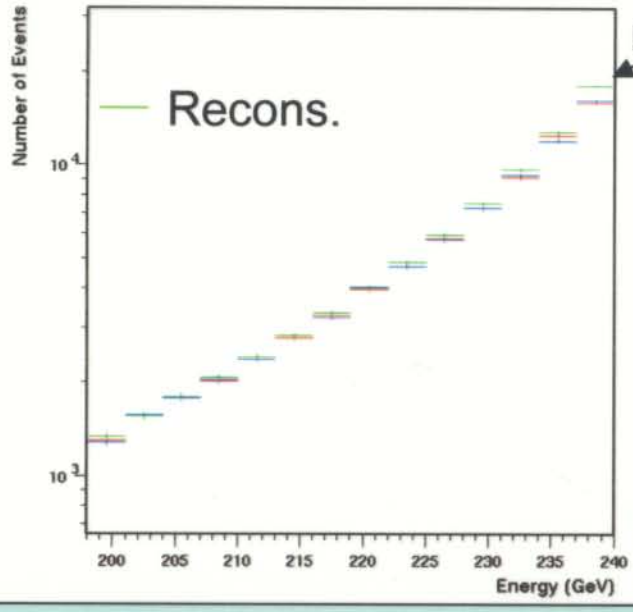
Unfolding (cont'ed)



GURU



Works if we constrain our study up to 240 GeV:

$$\chi^2 = 0.135 \quad for \quad \tau = 0.399\ 10^{-6}$$

Unfolding does not work if we ask up to 250 GeV!!

$$\chi^2 = \sum_{i=bin\#} \frac{(x^i_{unf} - x^i_{true})^2}{|x^i_{true}|}$$

Future plan

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- Now loop is closed, need to extend the study:
- i.e. include Beamspread,
- a whole theta range (LCAL to LAT),
- Check this unfolding method helps to distinguish typical beams (with backgrounds),
- For this need to study constrain on the smoothing parameter (tau).