

Study of a Likelihood function for discriminating μ/π

Maura Barva
Roma 3 University

WHAT ARE WE DOING?

- We want to search a discriminant method for π & μ , for a direct measurement of R



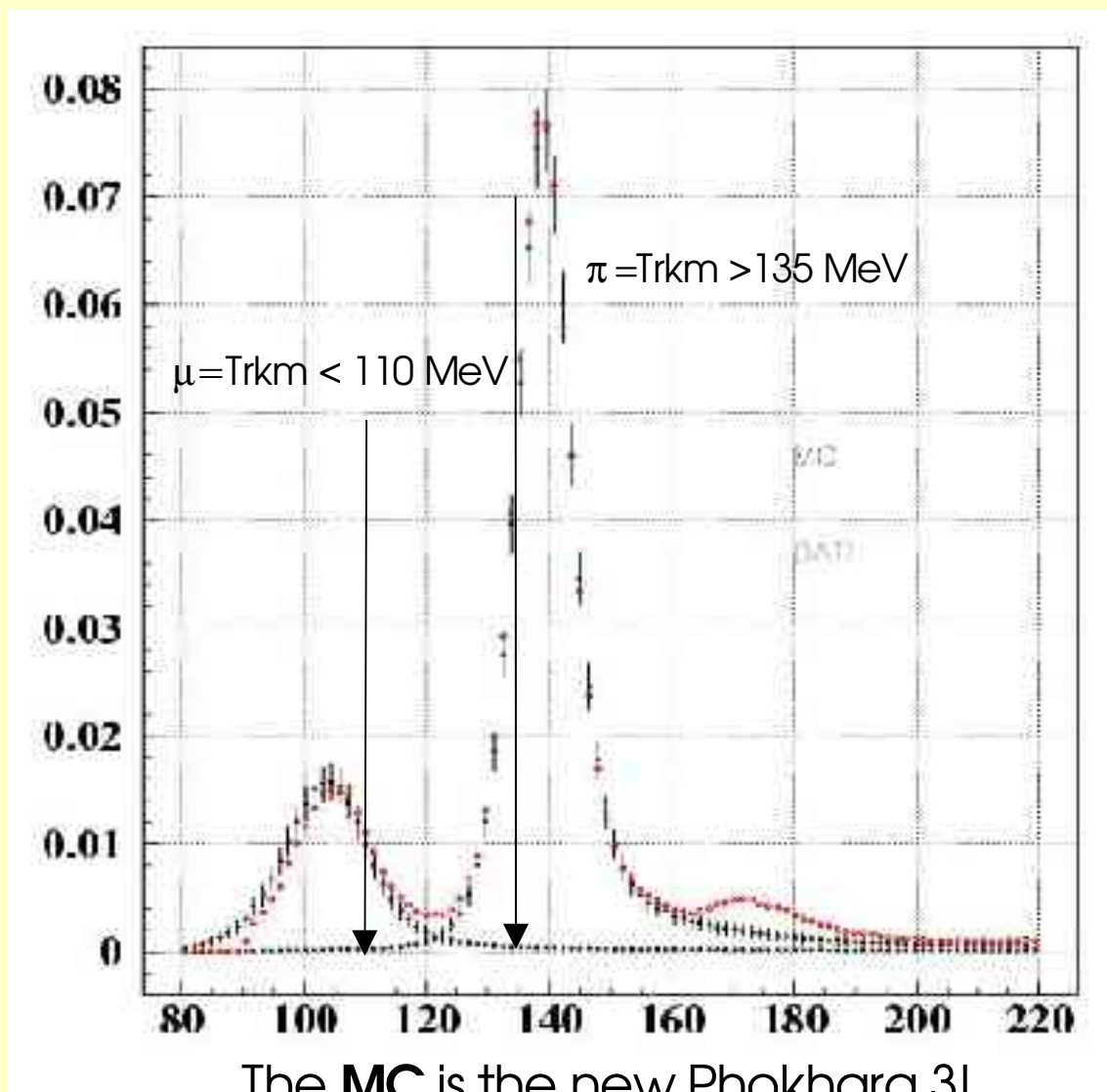
a Likelihood method

HOW?

- Looking for the difference between the two particles
- Studying the distribution of discriminant variables
- Fitting this distribution and define a likelihood
- Defining the Best Cut
- Comparing the new data selection with MC
- Estimating the efficiency

PRELIMINARY STUDY ON M.C.

CONTROL SAMPLE \Rightarrow CUT ON TRKMASS



At first we look for the best cuts for selecting clean sample of π and μ . This cuts are chosen from a comparison MC with data.

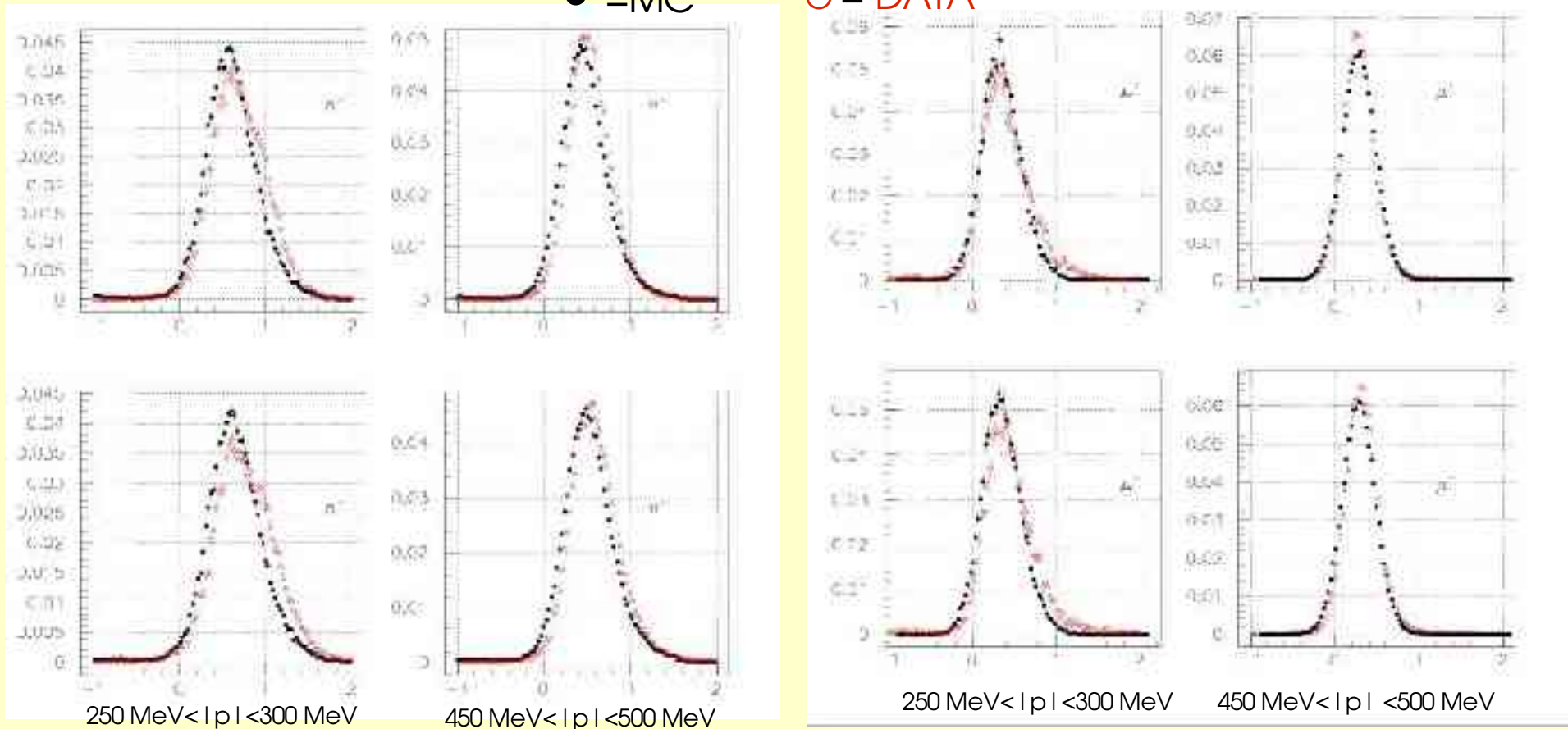
STUDY OF DISCRIMINANT VARIABLE: TOF

using a control sample from data (2002)

- Each variable is been studyed in five different momentum bins: from 250 MeV to 500 MeV, with a step of 50 MeV

● = MC

○ = DATA

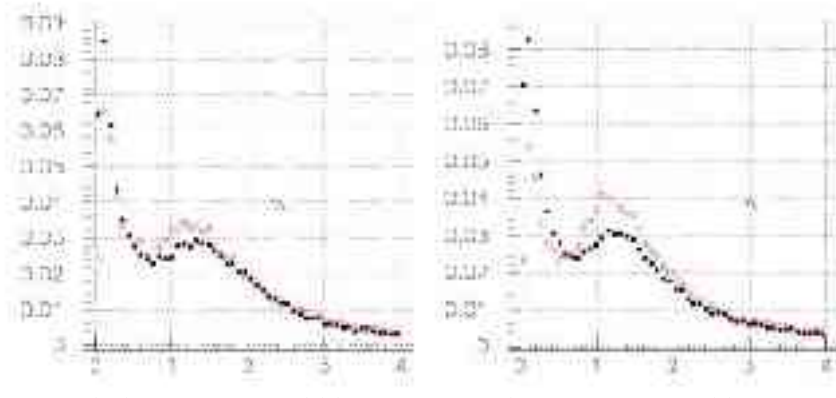
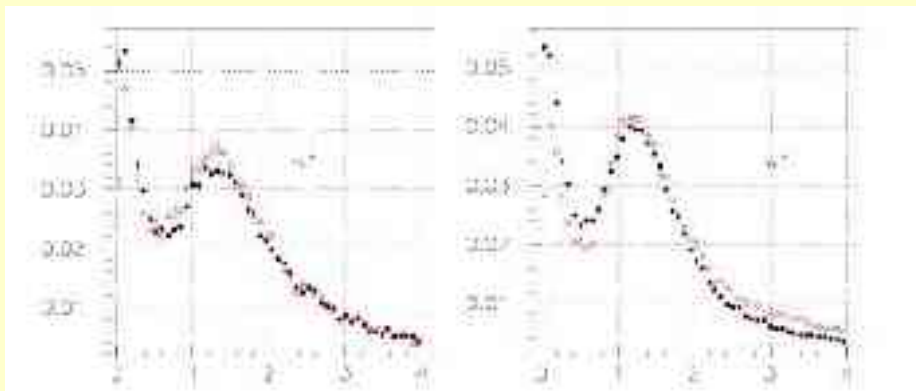


STUDY OF DISCRIMINANT VARIABLE: E_i/E_f

Ratio between energy release on
Last and First plane, $E_{min} > 5$ MeV

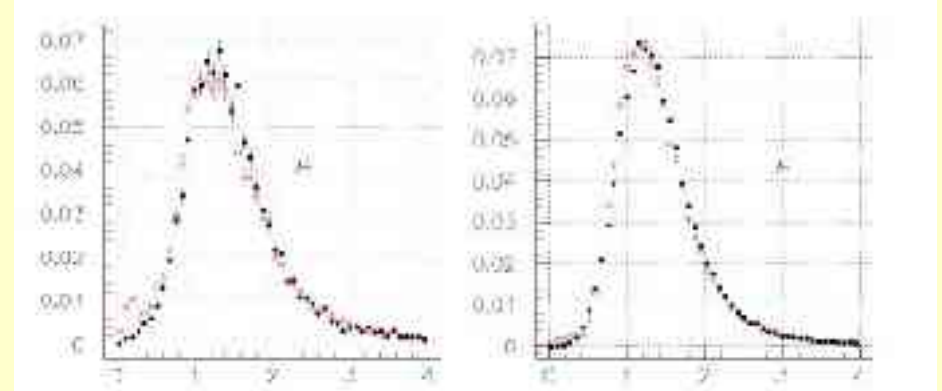
● = MC

○ = DATA



250 MeV < |p| < 300 MeV

450 MeV < |p| < 500 MeV



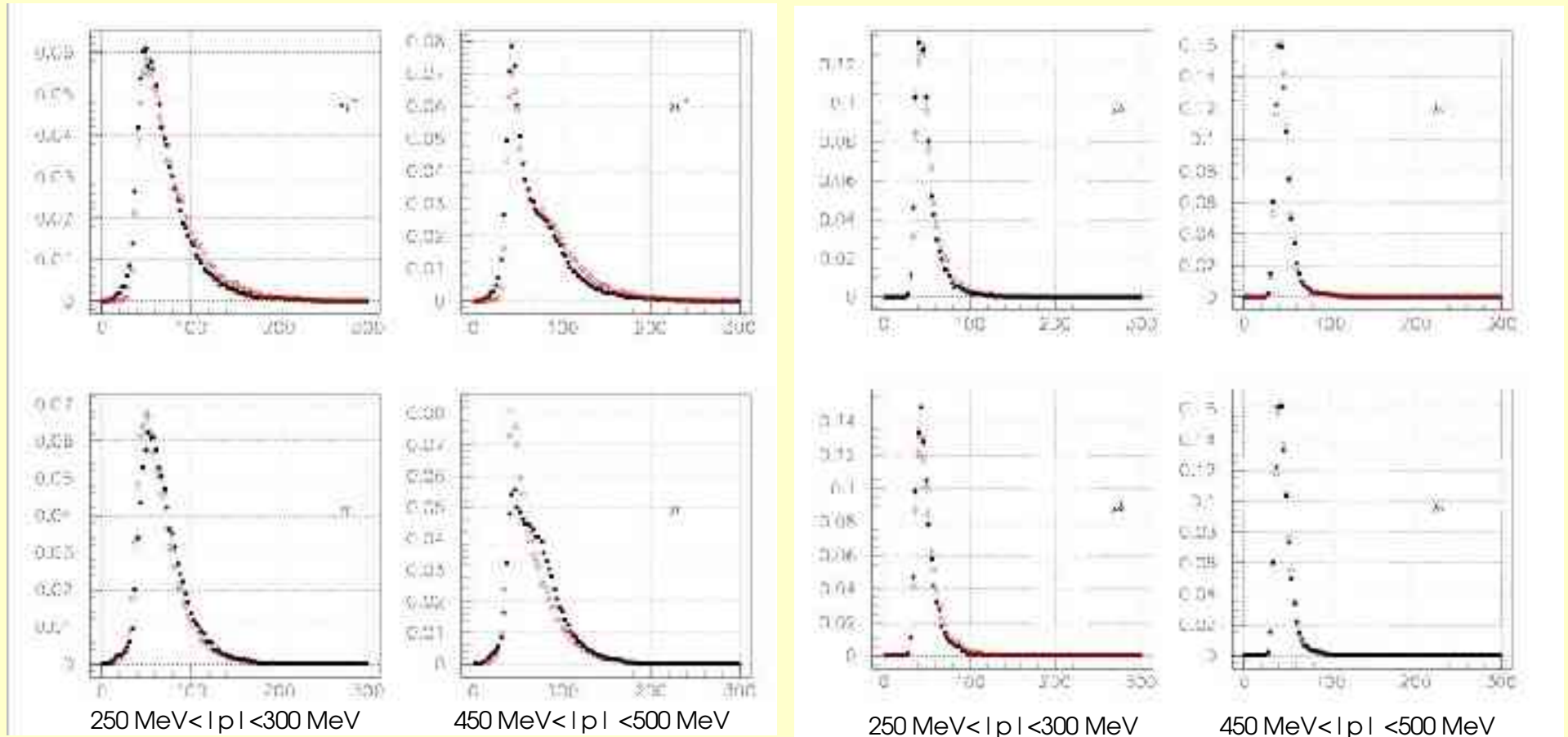
250 MeV < |p| < 300 MeV

450 MeV < |p| < 500 MeV

STUDY OF DISCRIMINANT VARIABLE: Ecluster/(#hit plane)

● = MC

○ = DATA

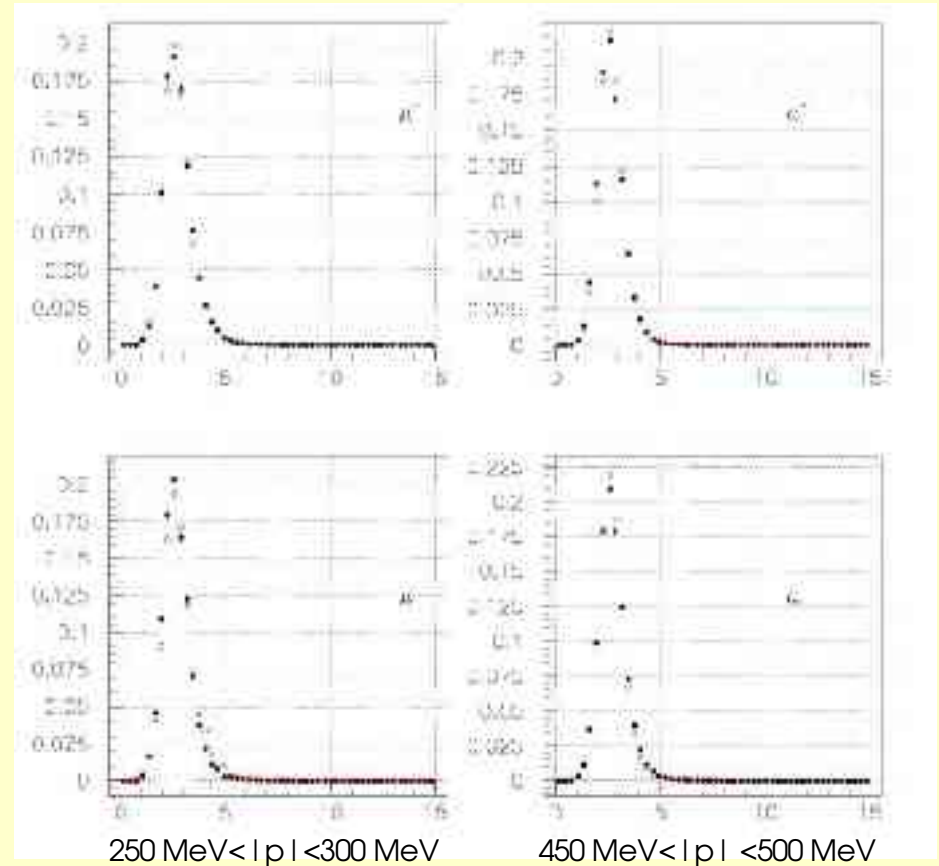
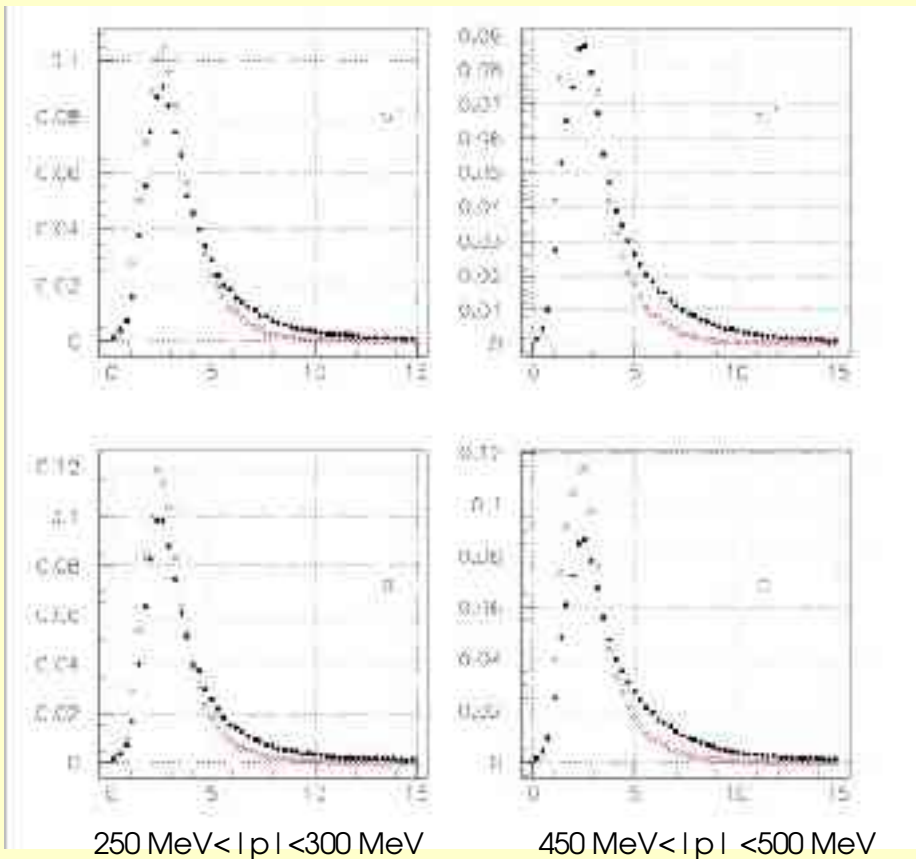


STUDY OF DISCRIMINANT VARIABLE:

$$\sum_i E_i - (6-n_i)/E_{cl}$$

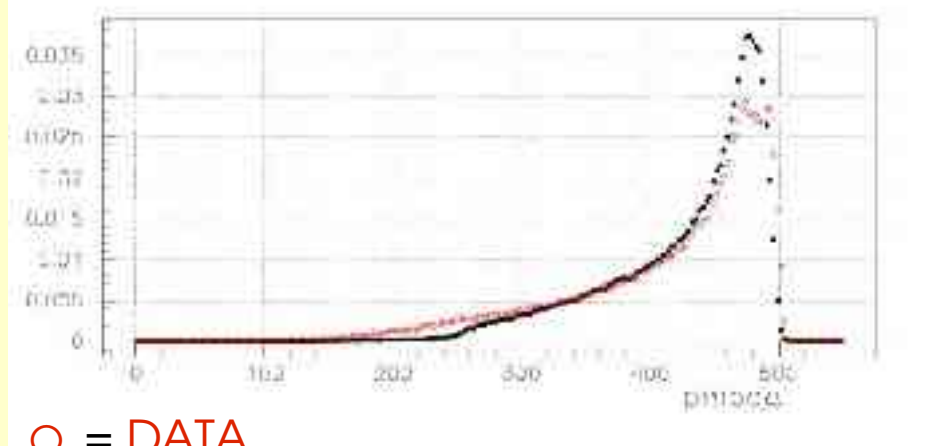
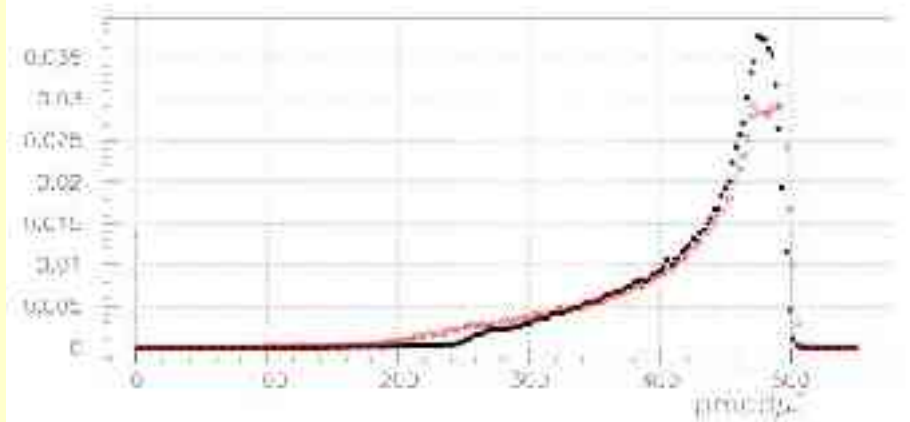
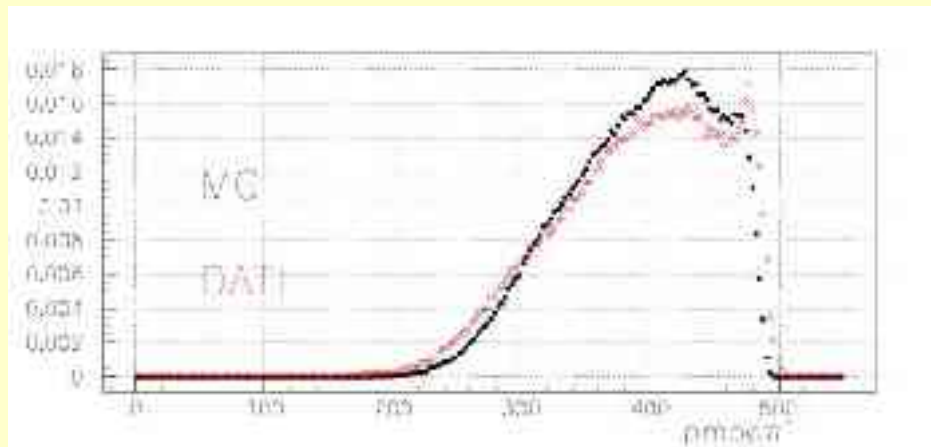
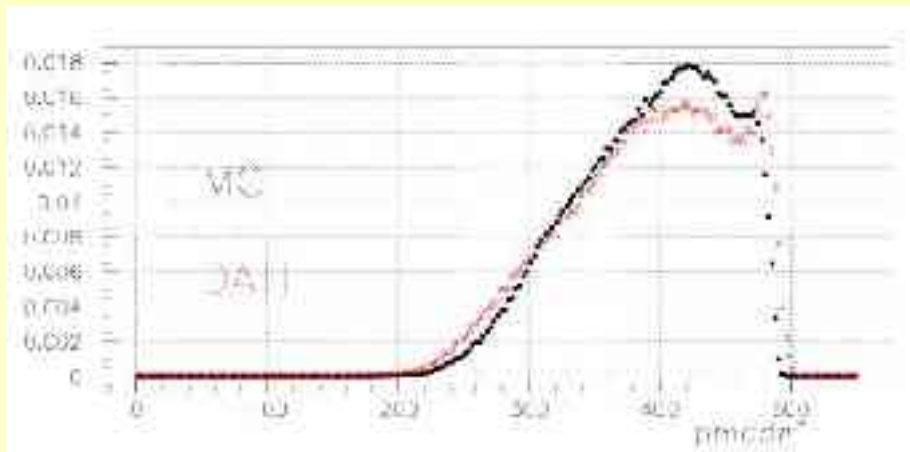
● = MC

○ = DATA



STUDY OF DISCRIMINANT VARIABLE: Pmod

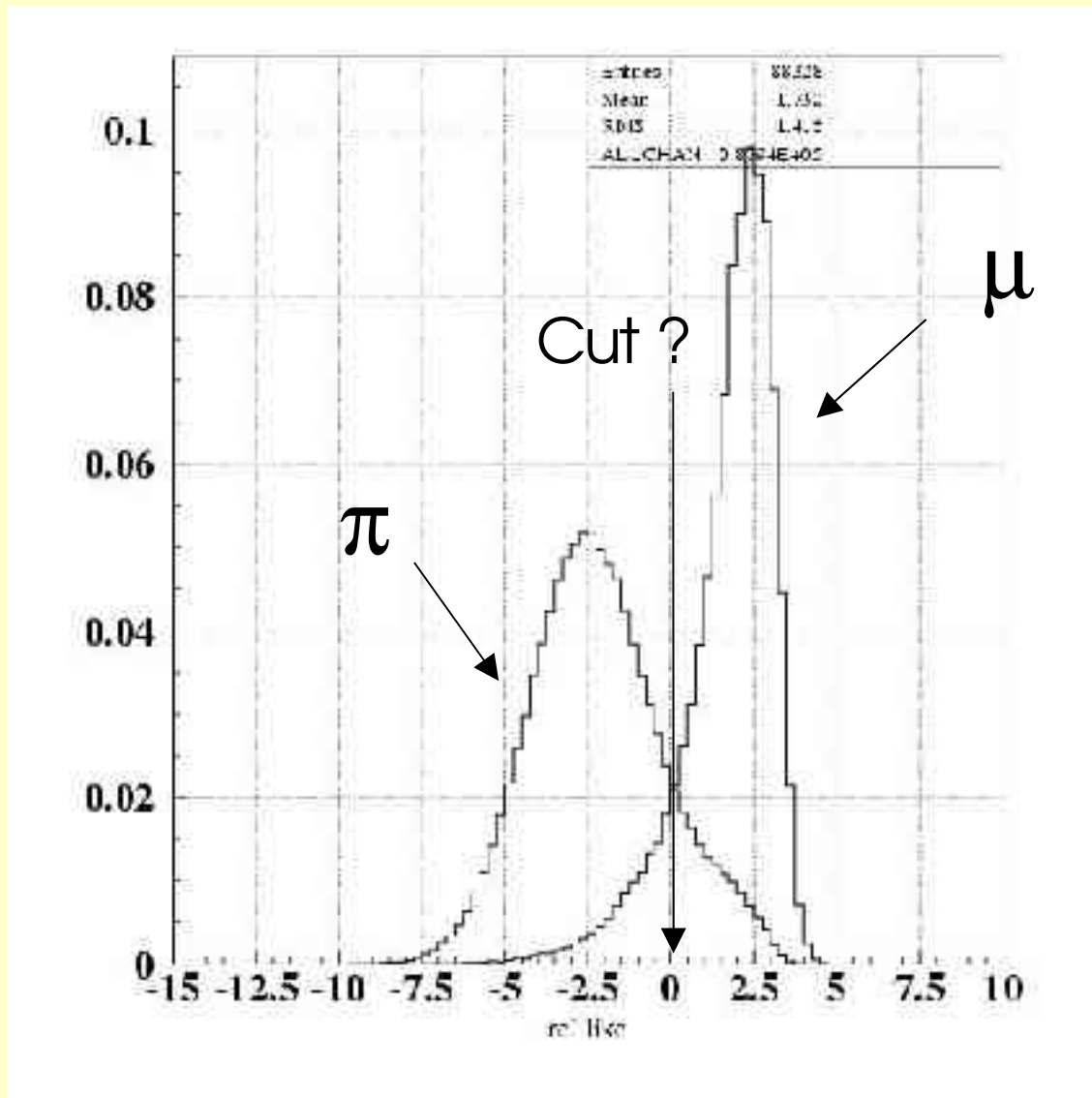
every distribution is normalized to 1 and by the product of the analitic function is obtained the likelihood



● = MC

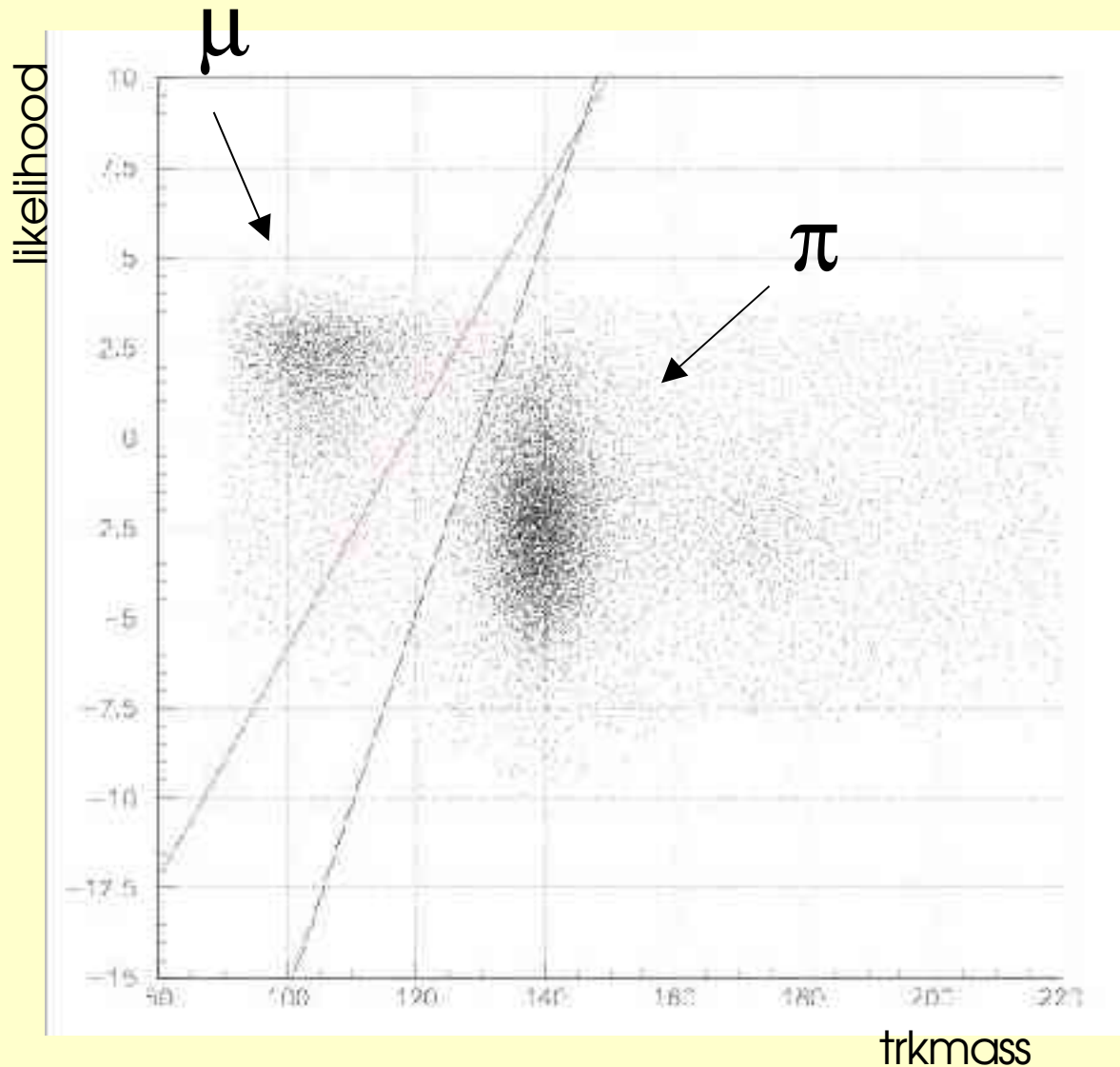
○ = DATA

THE LIKELIHOOD AND THE BEST CUT



As we can see in this plot it is not possible to operate with only a cut in Likelihood variable! So we have think about two possibilities...

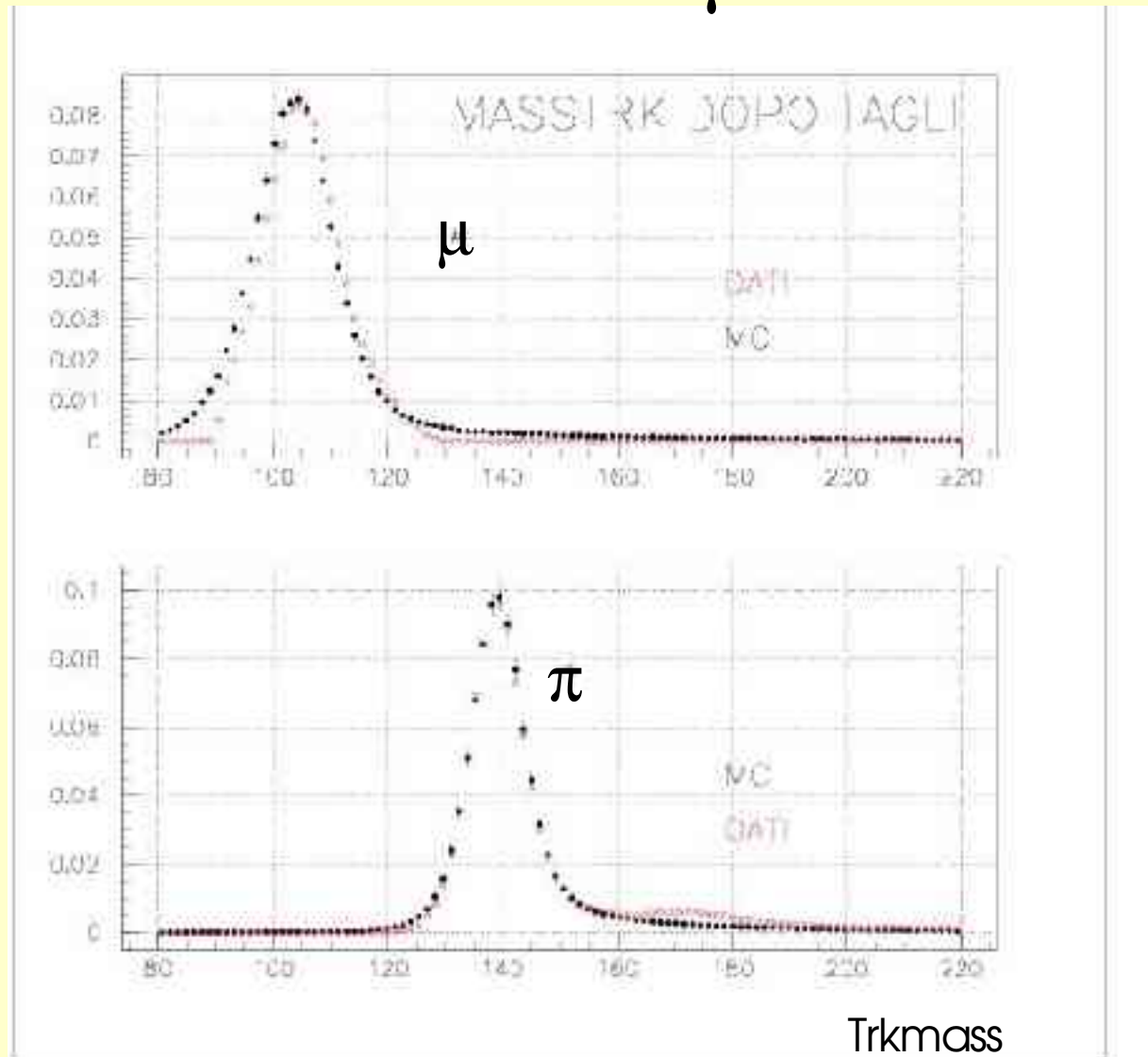
THE LIKELIHOOD AND THE BEST CUT



...Operate by **two cuts in the plane Likelihood vs Trkmass**, or analysed the **best cut bin by bin in Q^2** , evaluating efficiency and contamination for each cuts (work in progress...)

FIRST RESULT WITH PREVIOUS CUT: THE SELECTION π FROM μ

The reasonable agreement with MC shows that the selection is good, but the problem is to estimate the efficiency for this selection!



OUTLOOK:

- Evaluate the agreement MC-DATA to estimate the efficiency and systematics
- Testing the opportunity of make only cuts on the likelihood
- Provide a preliminary pion form factor spectral