Phi meson inclusive photoproduction in H1

Summerstudent Program 2007, DESY

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1 Introduction

I have studed $fi^0 \Rightarrow K^+K^-$ process. The problem is that there is no good determination of dE/dx losses in H1 detector in data of 2000 year. Ofcourse there is determination of it, but you need to calculate it's efficiemcy and it is very hard. So in comperison with for example data from 1996 year we can't get such a sharp peak. Because we can't separate K and Pi mesons properly. So, the combinatorical fon is very big.

2 More Details

I took data from the year 2000, because there is a Trigger83 and it takes only events with three tracks from primary vertex and a signal from an electron tagger and so, I can make some selection of only photoproduction processes. The first condition is not needed for us, but it is all we have. Ofcourse I took not only photoproduction processes, because there are some hard processes with signal in this tagger.

I took class H1CentralFittedTrack because there are momentum and charge of a particle in it. And looked throught all the combinations of one positive charged particle and one negative. Here is total transverse momentum of such combination.

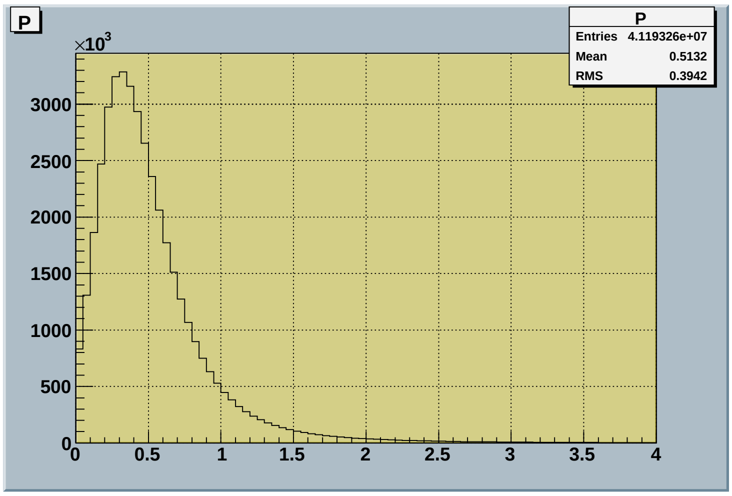

Figure 1: *Transverse momentum of two opposit charged particles.*

And invariant mass of these two particles. With assumption that both particles have masses of K mesons.

As you can see on the next histograms, there is no resonance of fi meson can be seen at all.

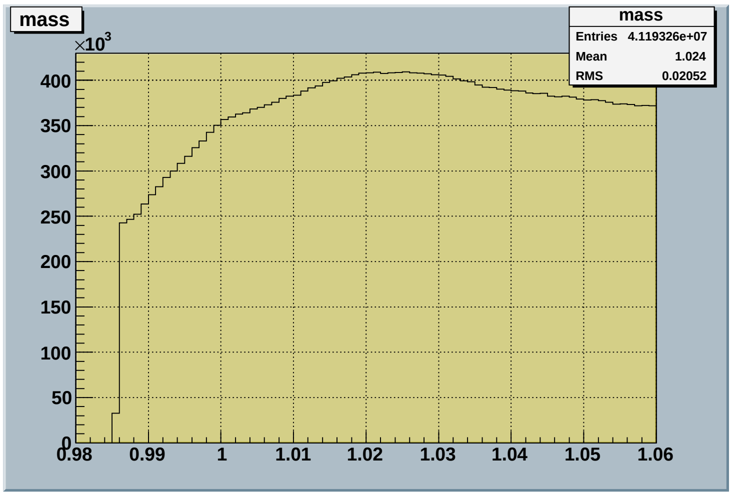

Figure 2: *Invariant mass of two opposit charged particles.*

3 Data Analysis

3.1 Monte Carlo

I've made some cross checks with generated data. Here are normalized histograms of Z_{ver} Ivariant mass and Pt. Blue have been tacken from Monte Carlo generated data and red have been taken from data.

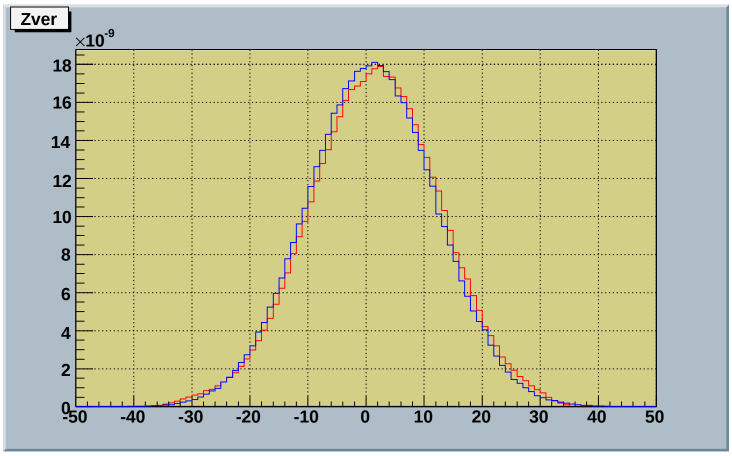

Figure 3: Z_{ver} *of primary interaction.*

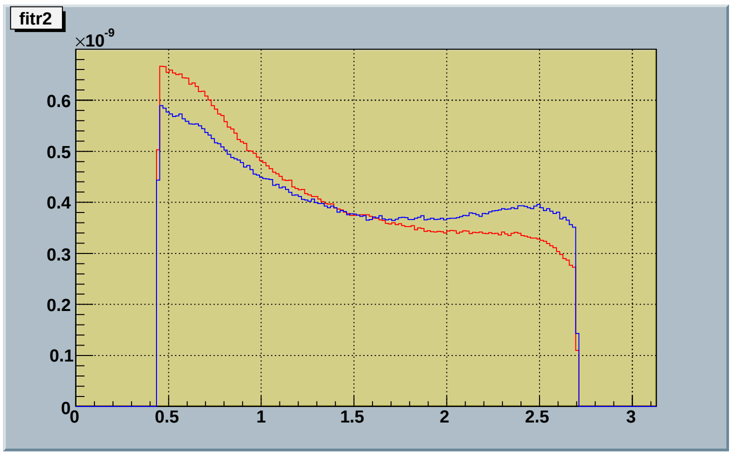

Figure 4: *θ angle distribution of a track.*

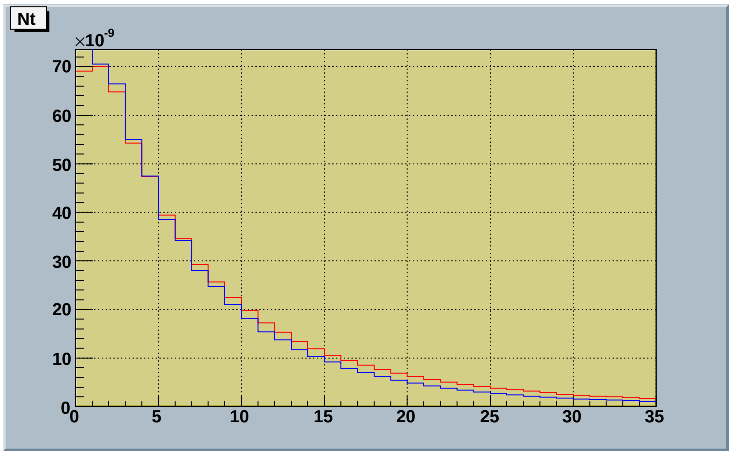

Figure 5: *Multiplicity of events.*

3.2 The Cuts

- Track selection:1)If the absolute value of pseudo rapidity is less then 1.5;2)Pt>0.15;
- cut on z-coordinate of interaction, $|Z_{ver}$-$Z_{nom}|<35$cm
- some cuts on transverse momentum
- TRIGGER83:DCRPhTc + E_{tag33}; trigger for taking photoproduction events
- $0.3 < y_e < 0.65$, $y_e = 1 - E_{tag33}/E_{ebeam}$

We should make cut on rapidity and transverse momentum of particle, because we shouldn't take tracks, only part of wich got in the detector. Or tracks wich has so small

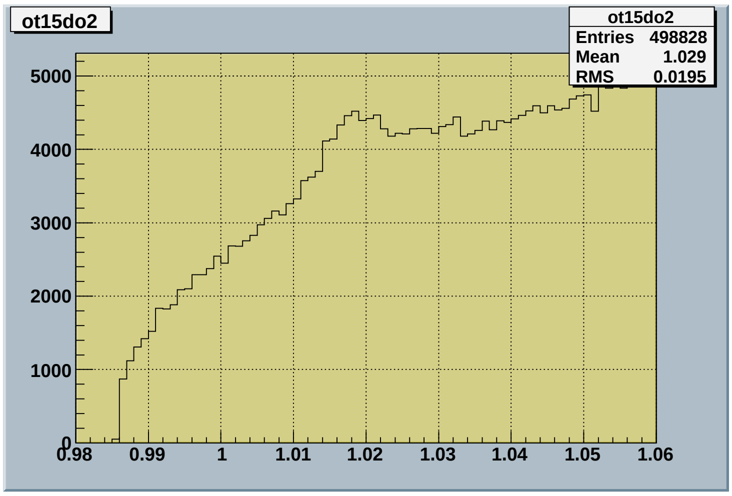

Figure 6: *Invariant mass of two opposit charged particles with 2.>pt>1.5*

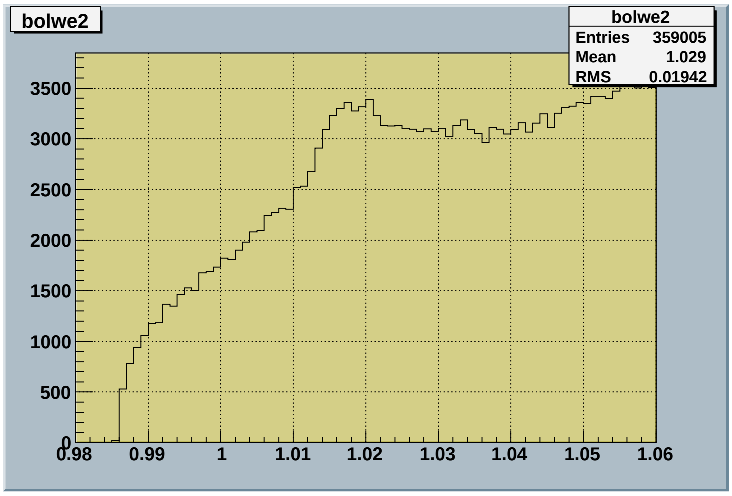

Figure 7: *Invariant mass of two opposit charged particles with pt>2.*

value of pt, that we cant determin it well. They are not reconstructed well, and we can tell nothing about what particles is that. The cut on Z_{ver} has been made for the same reason.

Cut on Trigger83 were made for taking only photoproduction events. And when y_e is from 0.3 to 0.65 the acceptence of electron tagger is the best.

Then I looked, how the invariant mass distribution looks like with the cut on the sum transverse momentum of dauter particles. Here are the histograms, depending on the region of transverse momentum.

Here we already can see fi^0 peak when pt is more than 1.5 GeV.

Then, I've looked at the cosine of angle of recession of two particles in the frame of fi meson rest. To look if there any polarization, because fi meson has a spin. Here is the

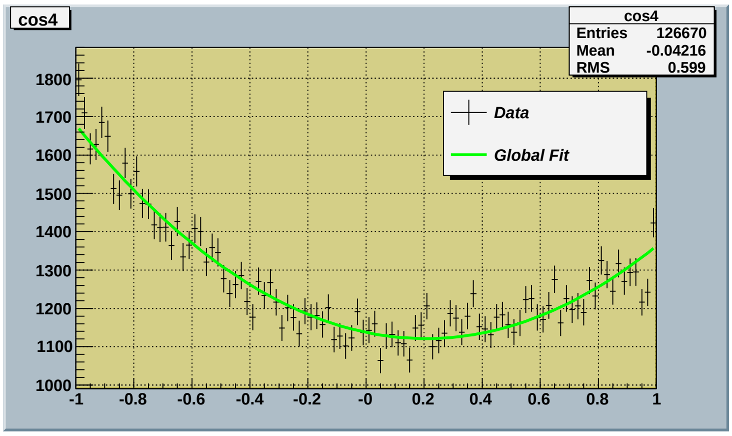

Figure 8: *The angle of recession between positive charged particle and fi*^{0} *with pt>2.*

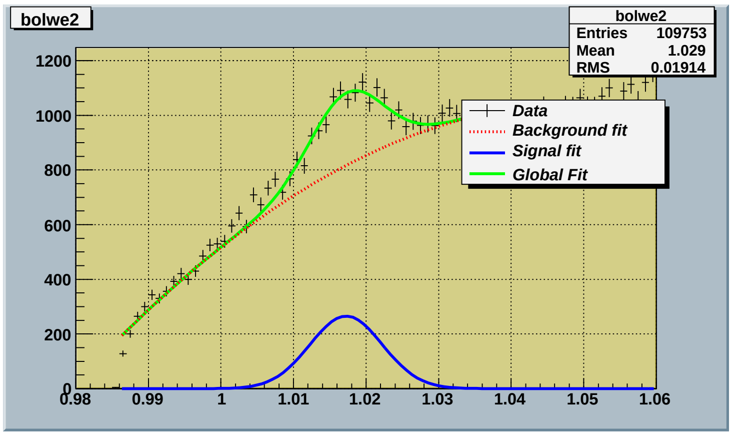

Figure 9: *Fitted invariant mass.*

distribution of cosine of angle between positive charched particle and it's mother.

But I havn't yet calculatid the polarization. We can already try to fit and calculate cross section on what we have.

There were observed N$_{phi}$=3323. So the next thing is to calculate efficiency of reconstruction and triggering. By simulating in Monte Carlo. Then calculation of Luminocity. And then the cross section will be $\sigma = S/(Luminosity * Efficiency)$.

4 Conclusion

It was just the begining of the work. I have studed a lot about h1oo, the structure of it, how to use different classes, depending on what we need. I've had a lot of practice in programming. Then i lerned how to work with root. I worked only with fortran befor i came to this programe, so it was very useful time because i lerned a lot about C++. There are much more abilities in comperison with fortran.

A further study of different particles become now much easier for me.

5 Acknowledgements

I what to thank my supervisor Rostovcev Andrei Afrikanovich. Also i would like to thank all the lecturers, who made such good lectures for us. And also all the organizers of this summer programme.

References

[1] "H1OO User Guide" *Dmitri Ozerov*

[2] "The Review of Particle Physics" *PDG*

[3] H1 detector description.