Some study of the forward PID system

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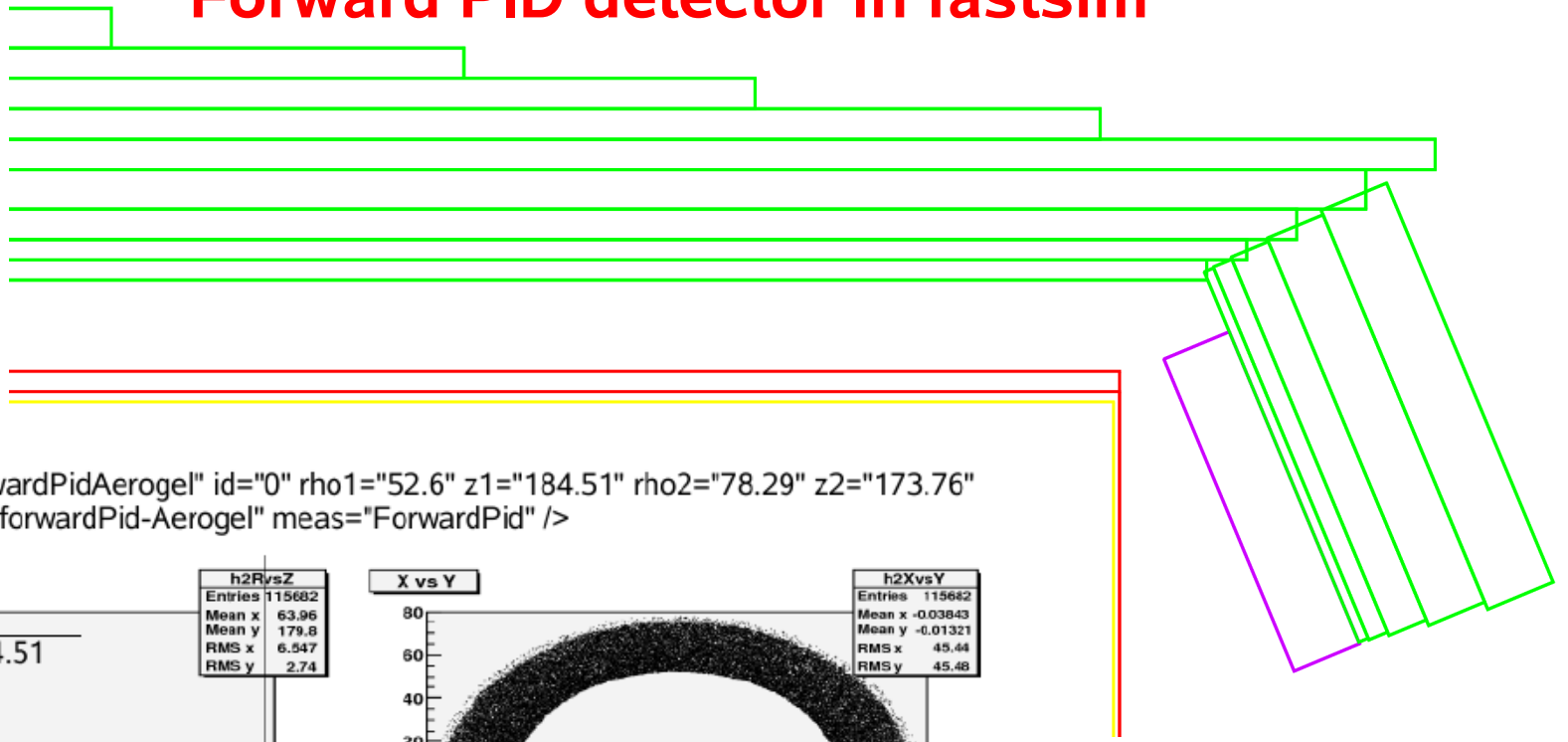
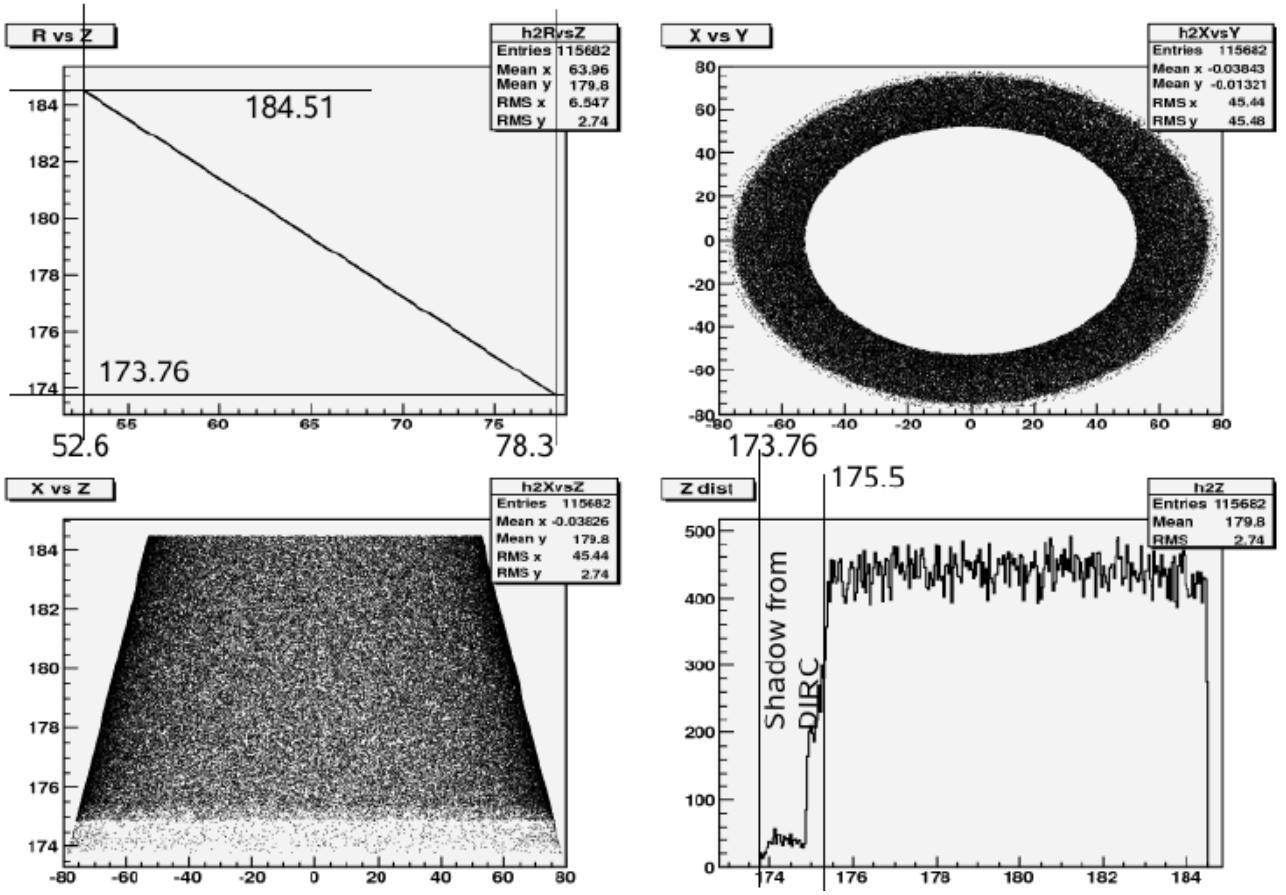
Outline:

-> Forward PID detector in fastsim
-> Particle selector in fastsim
-> Next step - migration from truth based selector to real selector.
-> Influence to the S/B ration of the forward PID in case of peaking background
    ->example with B0->rho+gamma
-> Example with Breco channel
    ->B0->D- pi+ pi+ pi-
-> conclusion
-> to do list

Forward PID detector in fastsim



<cone name="ForwardPidAerogel" id="0" rho1="52.6" z1="184.51" rho2="78.29" z2="173.76" thick="7.774" mat="forwardPid-Aerogel" meas="ForwardPid" />



Sensitive volume for the forward PID have been coded and tested.

Due to not available dE/dx information for DCH, the truth based selector was used.

Particle selector in fastsim

The first truth based selector did not take into account the momentum and theta of the track

We use BaBar run6-r24c PID tables to create new truth based table selector

Example of the table. For a given bin on theta 25.0°>theta>15.6°
and 60 equal size bins of momentum 4.96> mom>0.289

ANGLE 15.6 25.0
MOMENTUM 60 0.289583 4.96042

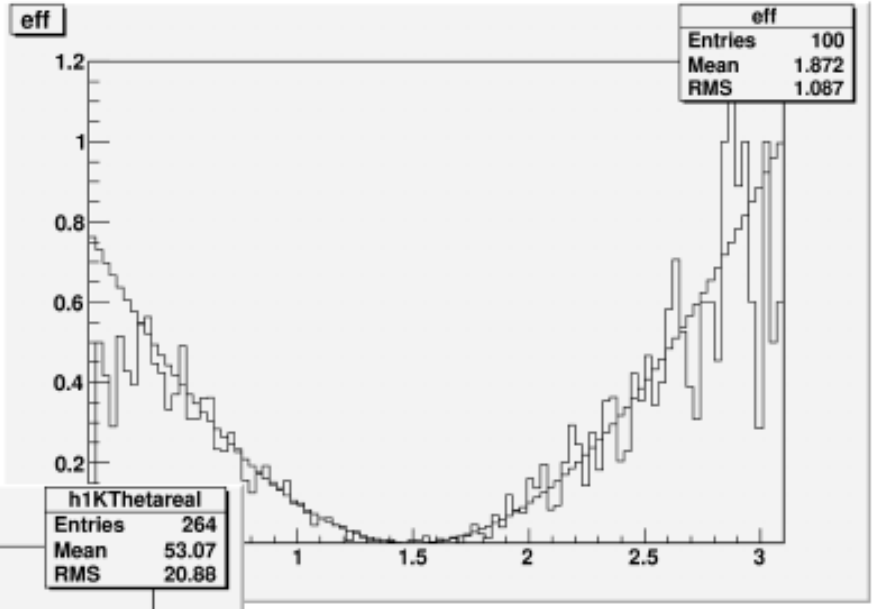
mom	e	mu	pi	K	pron
DATA					
0.289583	0	0.00243576	0.00188678	0.541667	0
0.36875	0	0.00345289	0.00267467	0.767857	0
0.447917	0	0.00447002	0.00941918	0.991999	0.0072548
0.527083	0	0.0255947	0.00952798	0.973379	0
.....					
.....					
.....					
END					

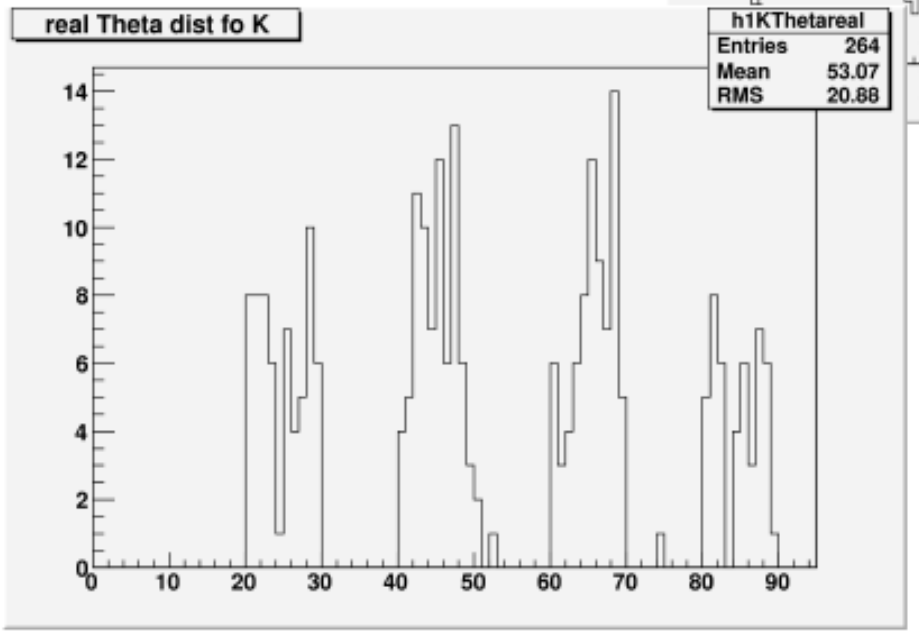
- In one file any number of the theta bins can be used
- Bin size for momentum is constant
- Selectors are nested (..tight, loose...)
- table path is given by tcl file
- Bit map for PID selectors is available
- Description information available in the superB wiki page

For the moment table based selector was used for forward PID studies

Test for table implementation

momentum--->

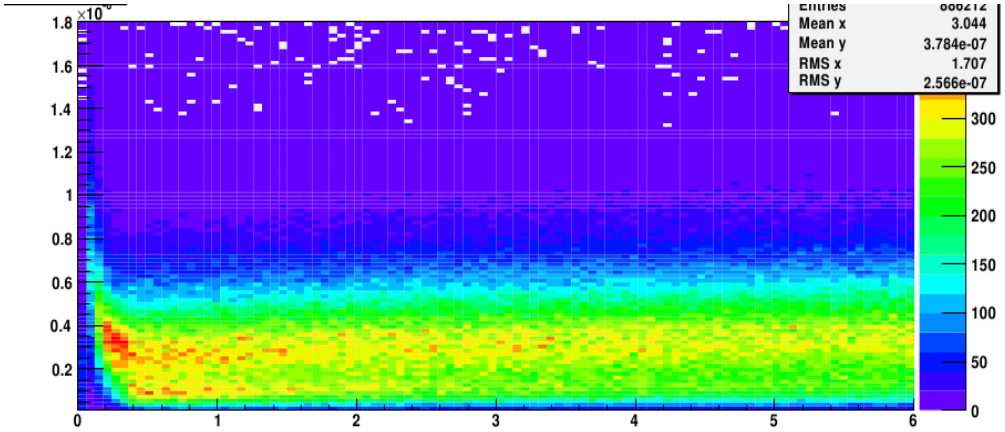




<-------theta

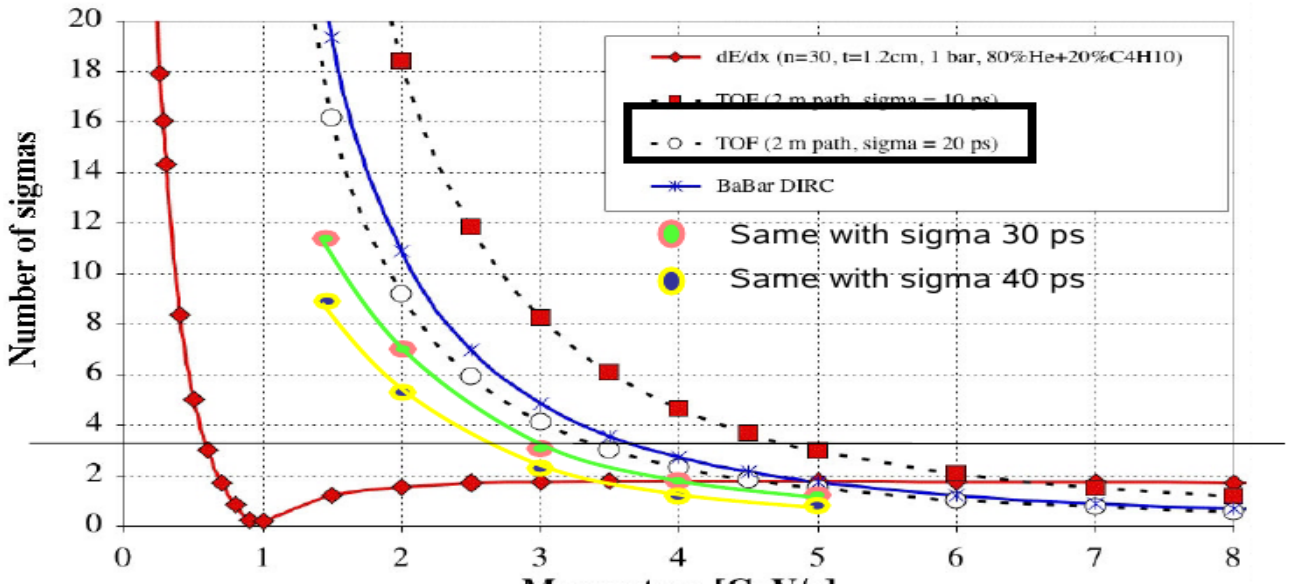
Next step - migration from truth based selector to real one.

dE/dx information is now almost available in the fastsim. So we can move to real selector.

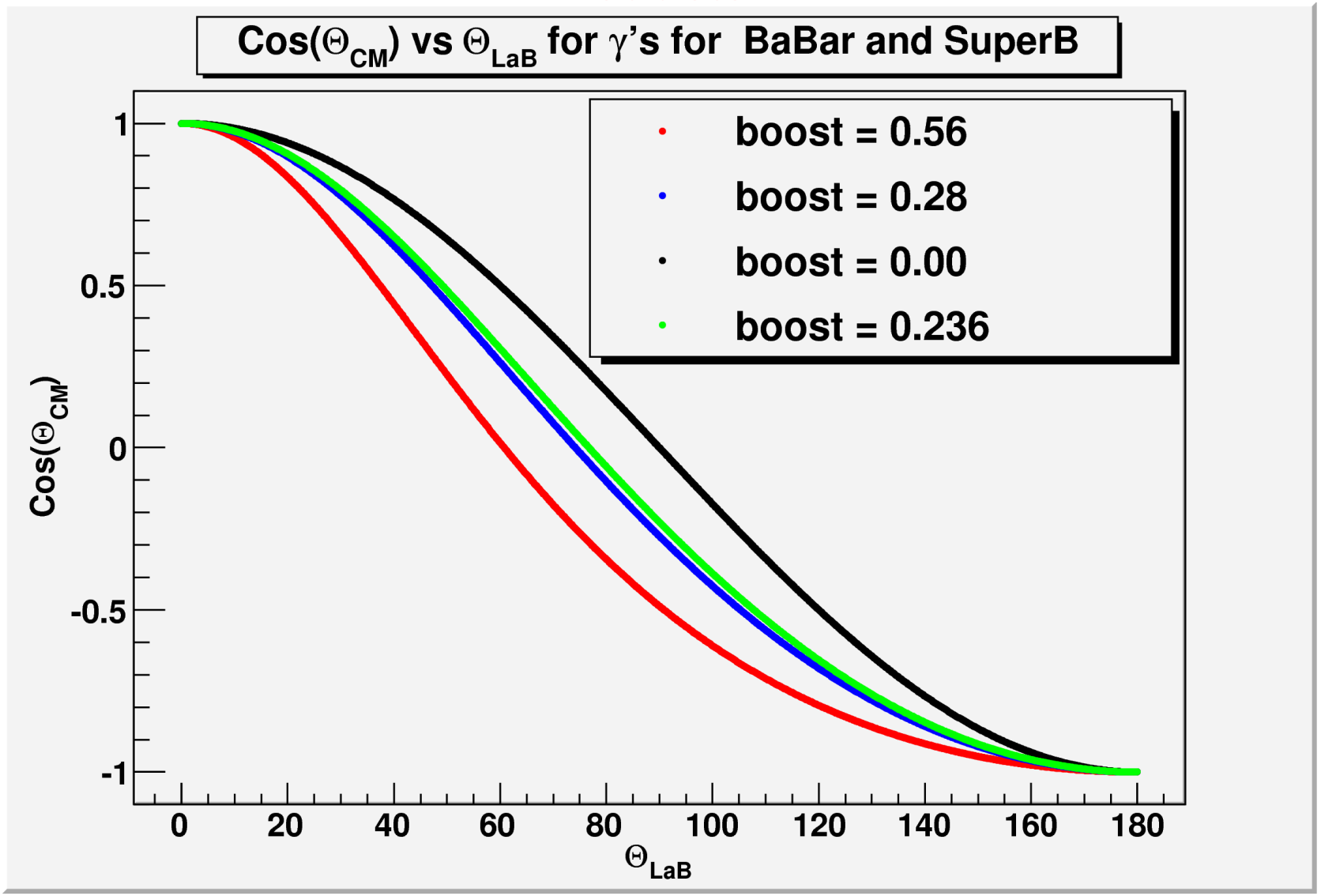


Some parameters of the dEdx information have to be tuned and compared with present table based selector.

The TOF PID system will be tuned to have the same performances as a present ones for DIRC.

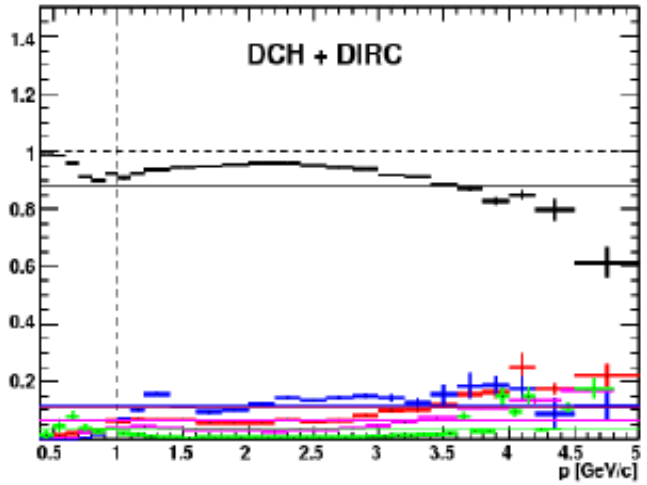


Protractor

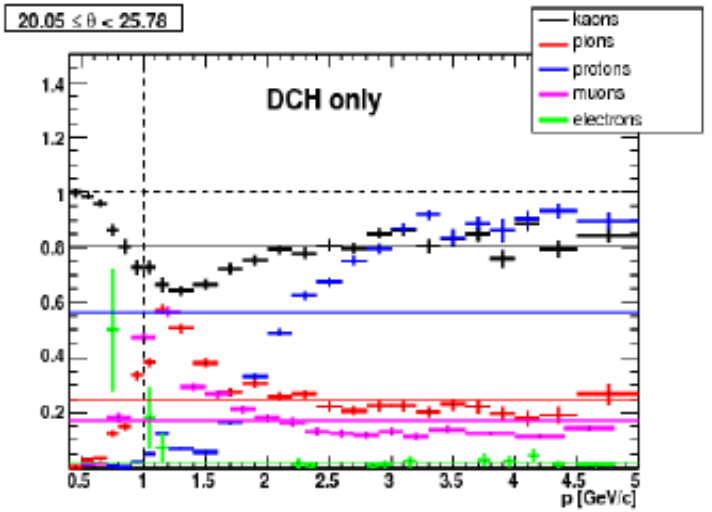


DIRC		mid DCH (20 layers)		FWD TOF	
boost 0.00	84.4%	boost 0.00	92.6%	boost 0.00	2.8%
boost 0.28	**85.5%**	**boost 0.28**	**93.4%**	**boost 0.28**	**4.7%**
boost 0.24	85.6%	boost 0.24	93.3%	boost 0.24	4.4%
boost 0.56	83.4%	boost 0.56	92.5%	boost 0.56	7.3%

Strategy to use table base selector in order to see the effect from fwd TOF



Forward region with TOF
15.6-25.0



Forward region with DCH
25.0 20.0

Some preliminary examples on physics channels using these tables

Example with B0->rho+gamma

We generate two samples

B0 → ρ0γ → π− π+ γ

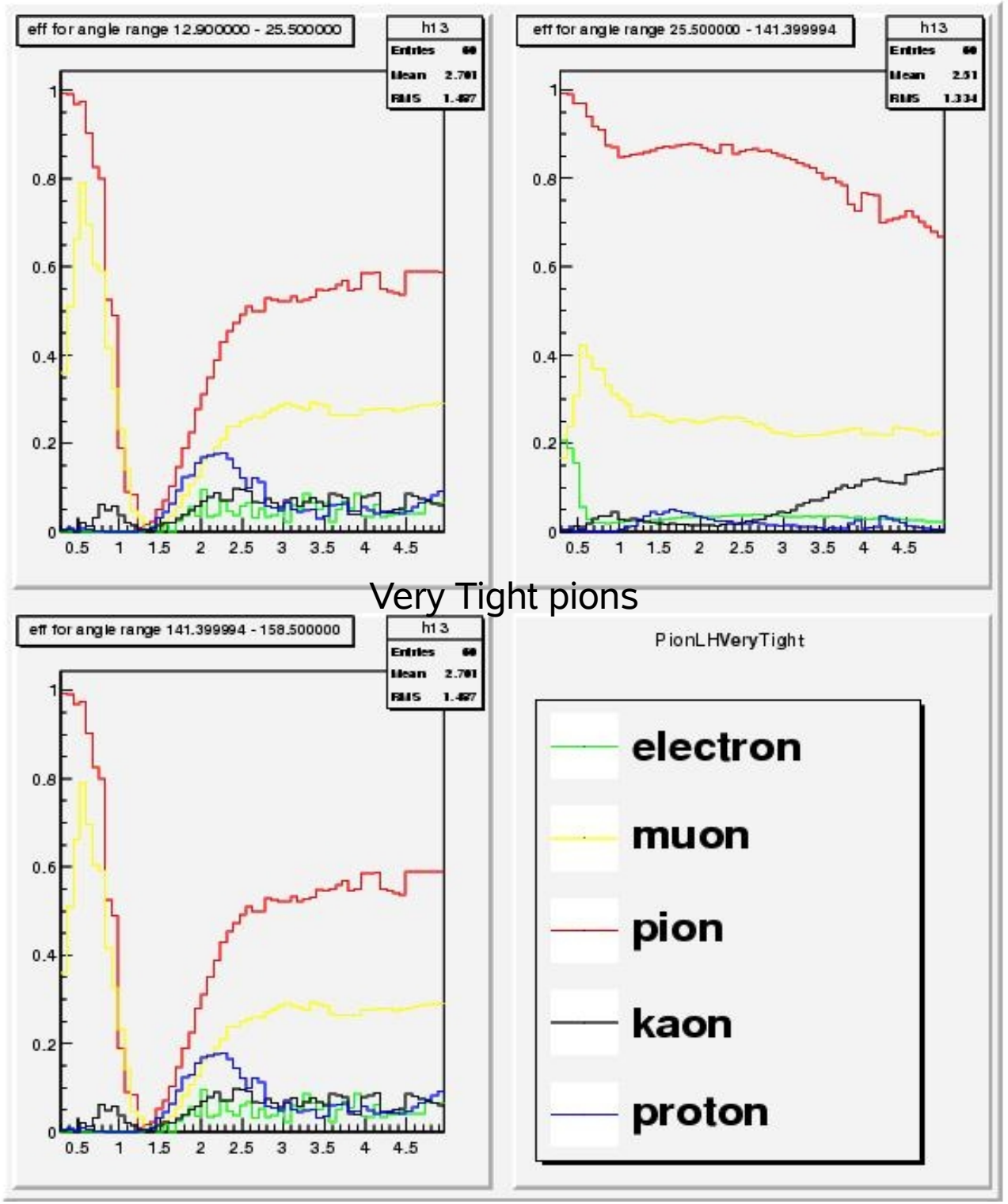
B0 → K∗0γ → π− K+ γ (peaking background for ρ0 γ)

[in this case we consider that all the background is just K*0 γ and we can evalaute the gain on S/B using forward PID]

Analyse the two samples:

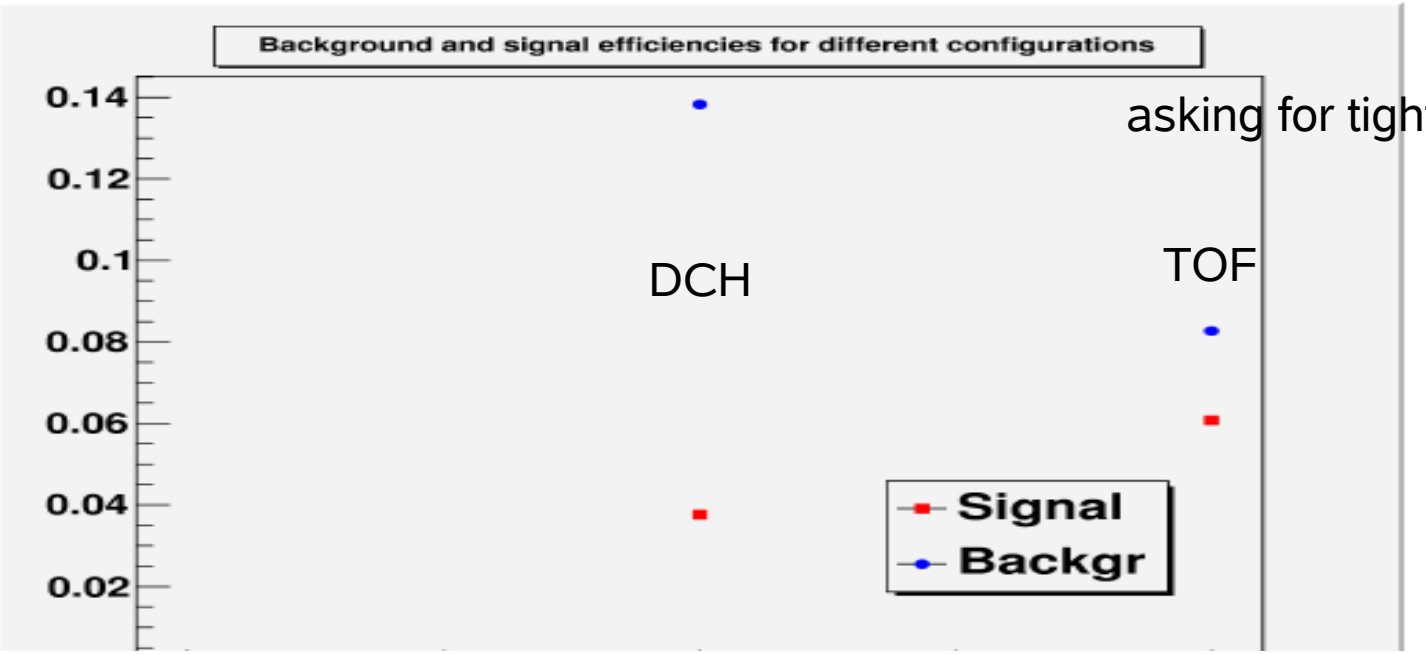
Simplified analyses

- ππ mass in the r region |M(ππ)-M(ρ)|< 0.2 GeV/c2
- Kπ mass in the r region |M(Kπ)-M(K*)|> 0.08 GeV/c2
  (where the K is assigned to the particle with highest momentum in the pair)
- Construct mES variable and cut 5.275 GeV/c2<mES<5.285
- dE cut -0.1 to 0.1



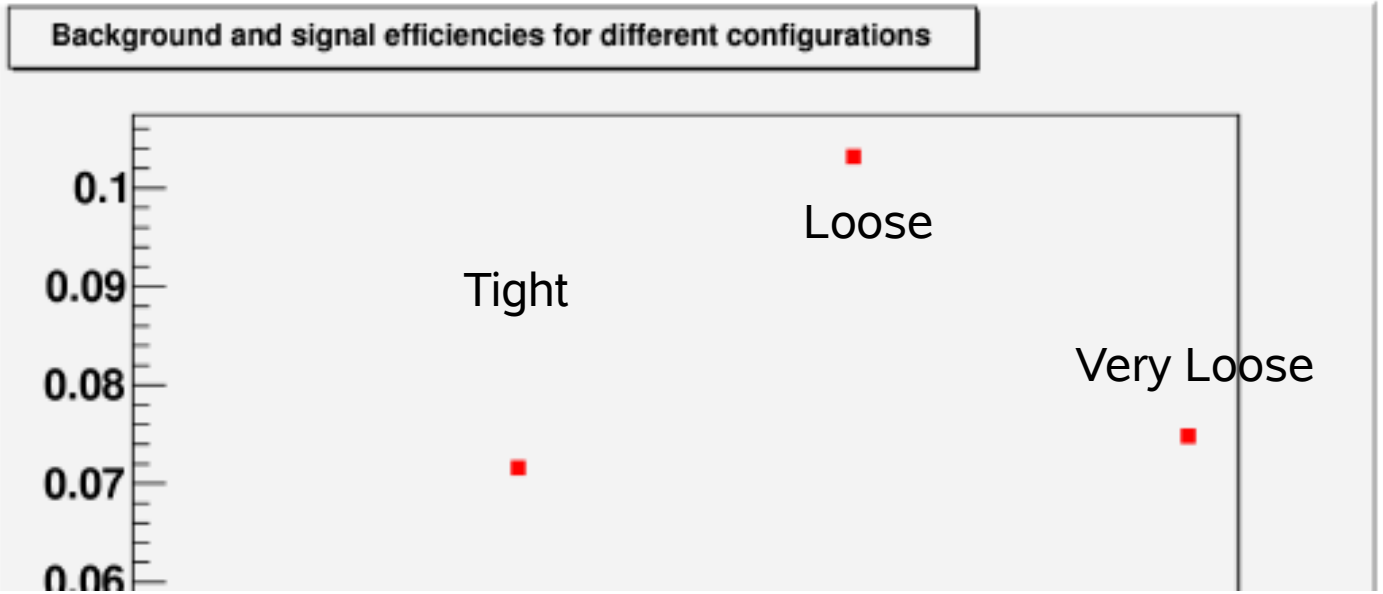
Very Tight pions

Results



asking for tight pions

S/B

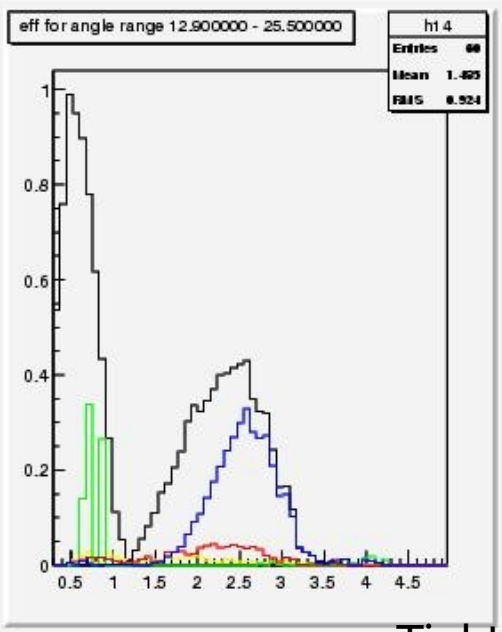


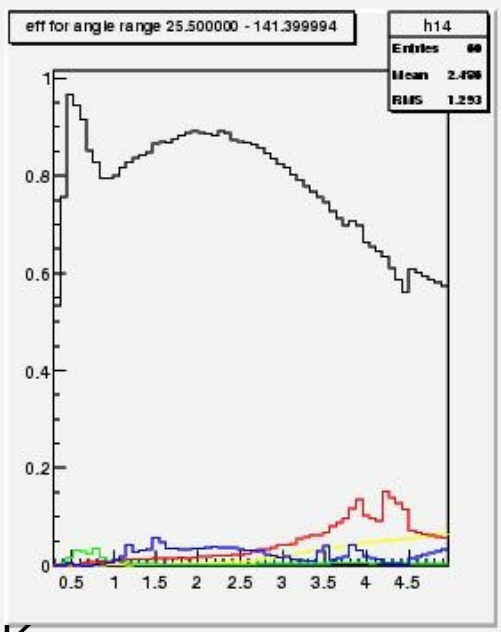
Example with Breco channel

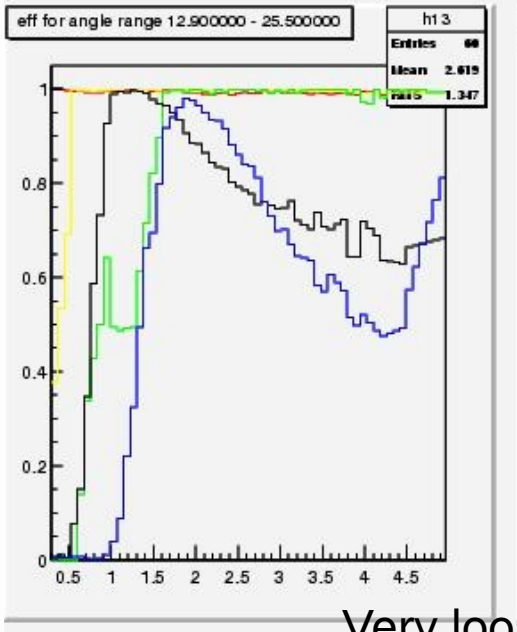
†Generic B Bbar

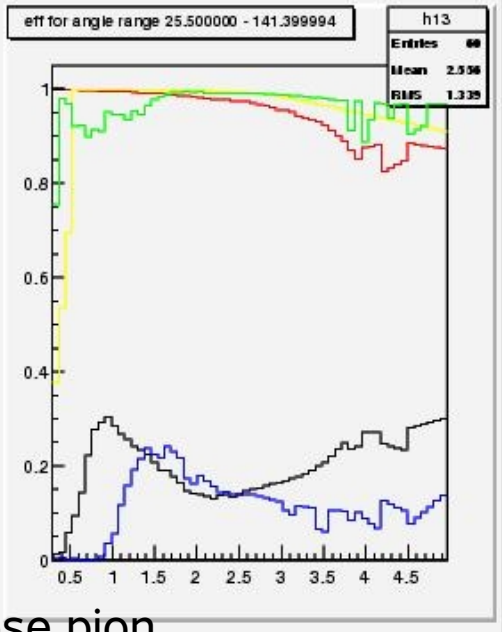
†B-> D pi pi pi
D K pi pi

cuts for D mass dE prob(chi2)

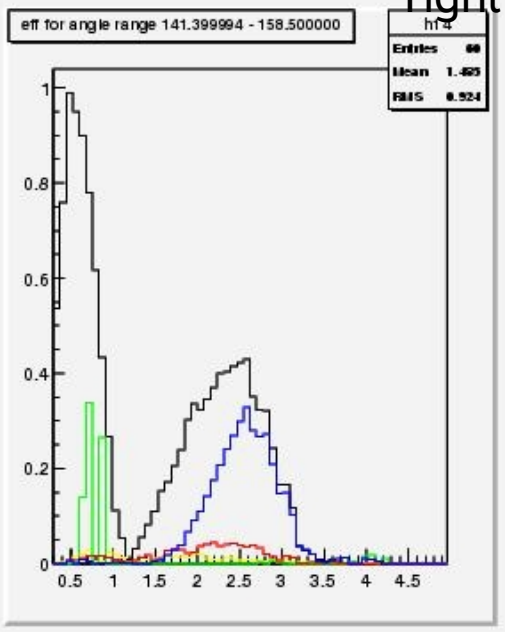


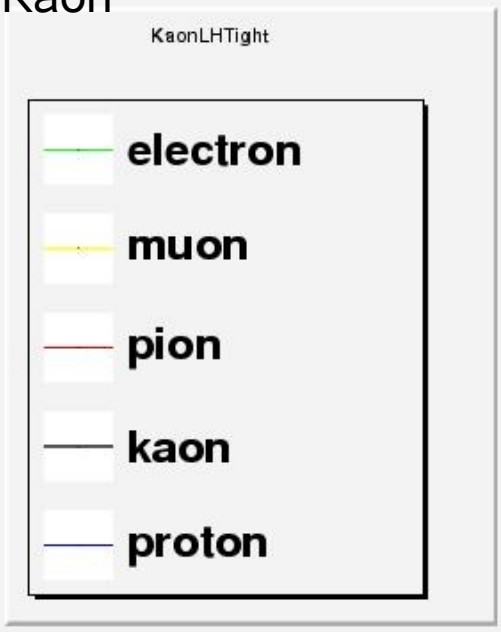




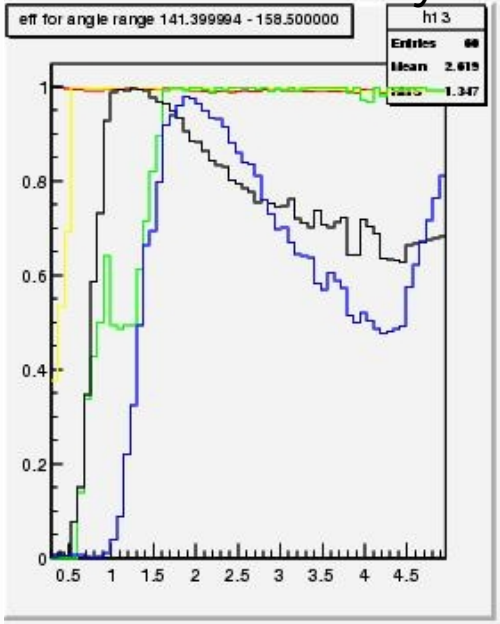


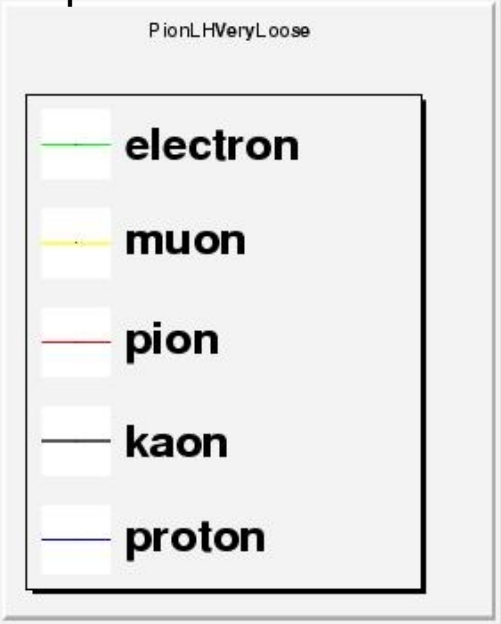
Tight Kaon





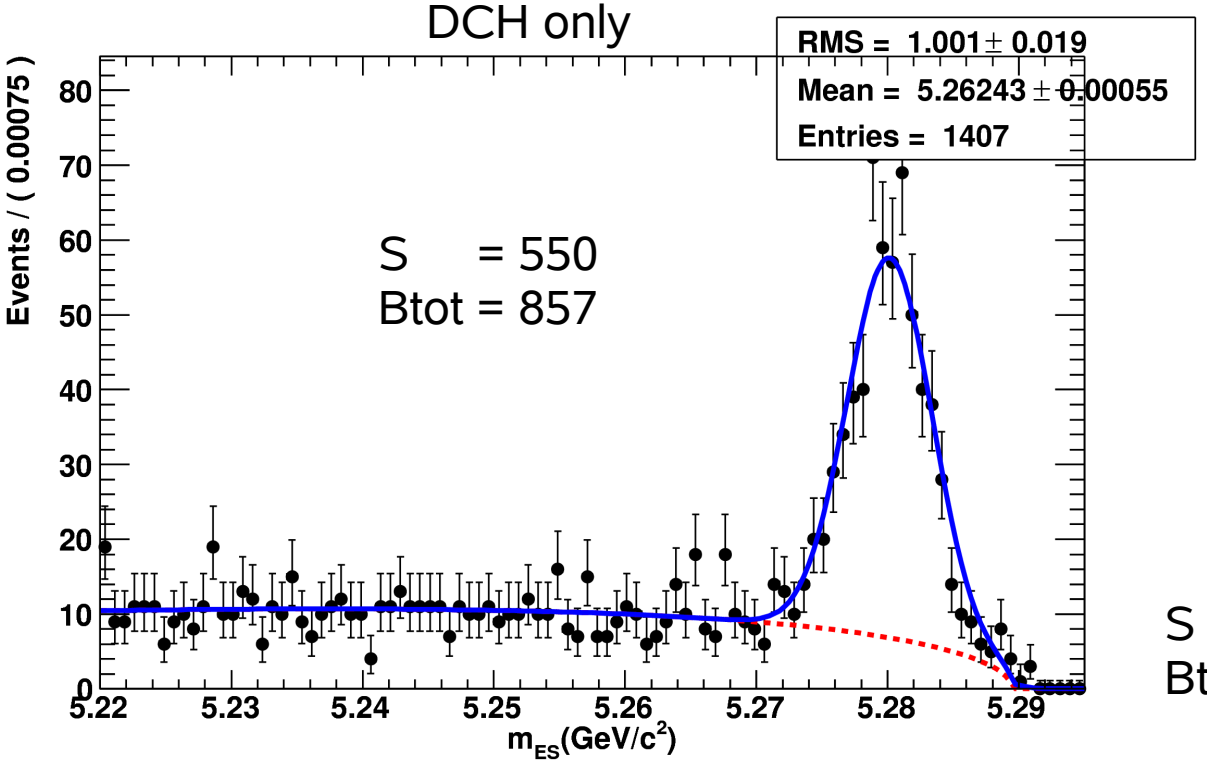
Very loose pion





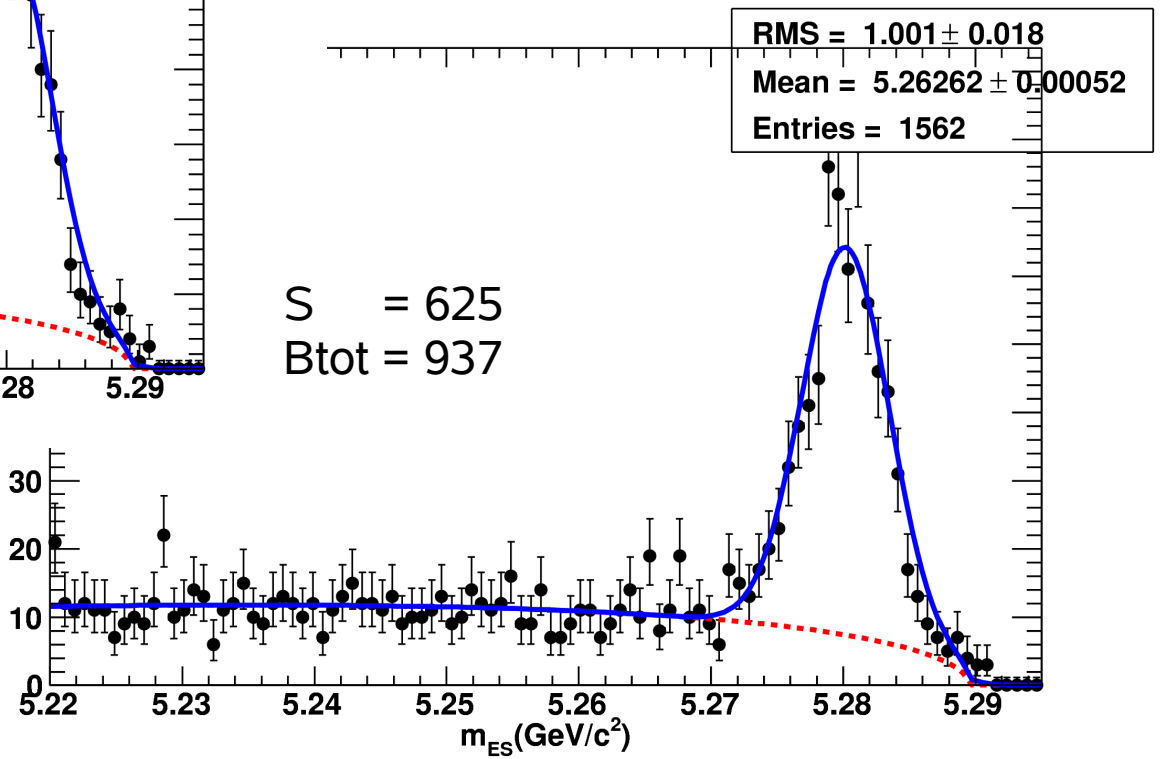
We ask all pions to be very loose
and a Kaon to be tight

Forward just covered by
DCH only



S = 550
Btot = 857

Forward TOF



S = 625
Btot = 937

Gaining in signal
efficiency of ~ 13%

This is BaBar configuration