

0

**OUTLINE**

Analysis done with 10,000 signal M.C. events produced by evtgen

**Analysis updates:**

- *cc mode of  $D^0 \rightarrow K_S \pi^0$  added*
- *Improvement in fitting in  $D^0 \rightarrow K_S \pi^0$*
- *New result from  $D^0 \rightarrow K_L \pi^0$*

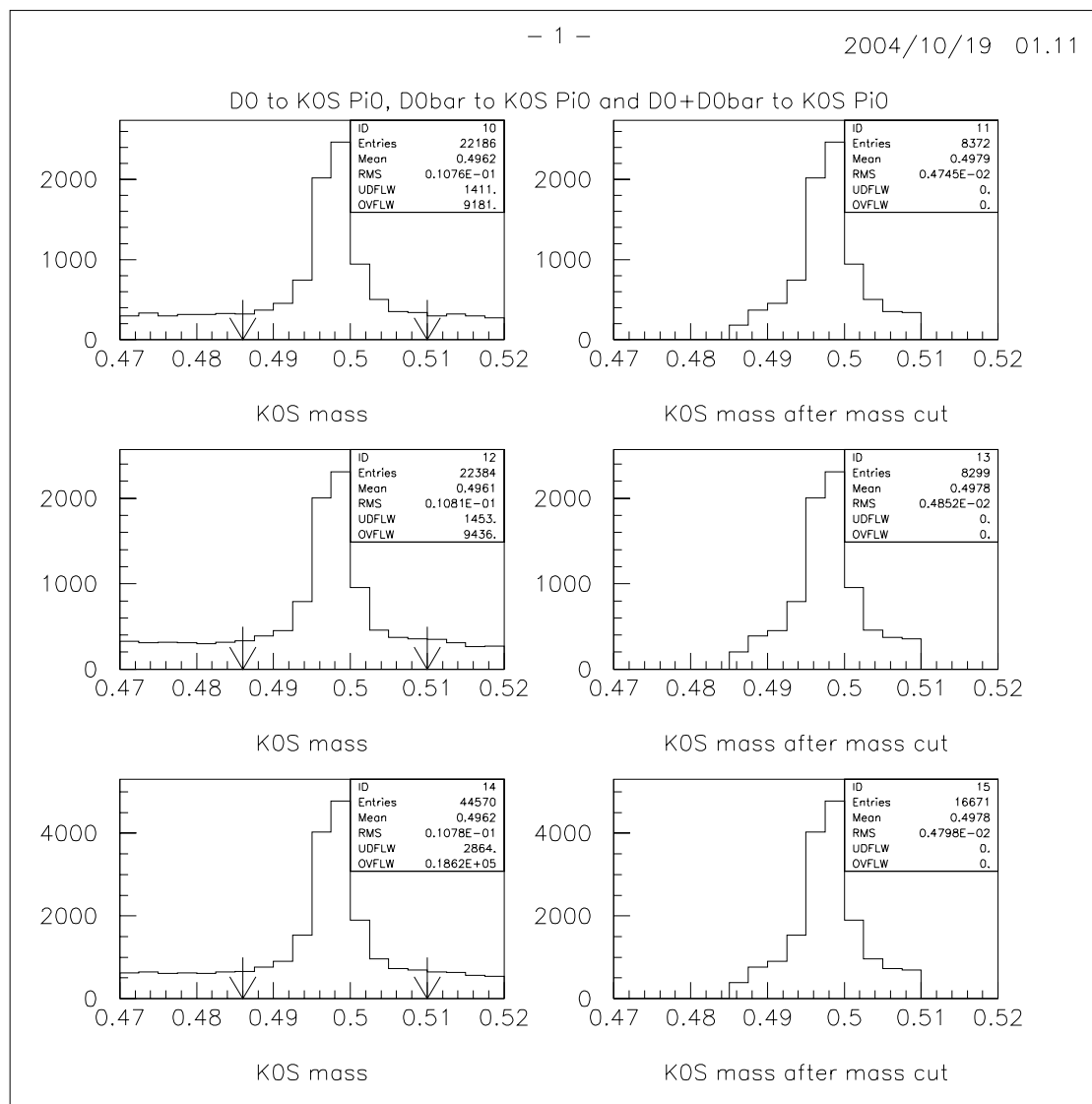
$$D^0/\bar{D}^0 \rightarrow K_S \pi^0$$

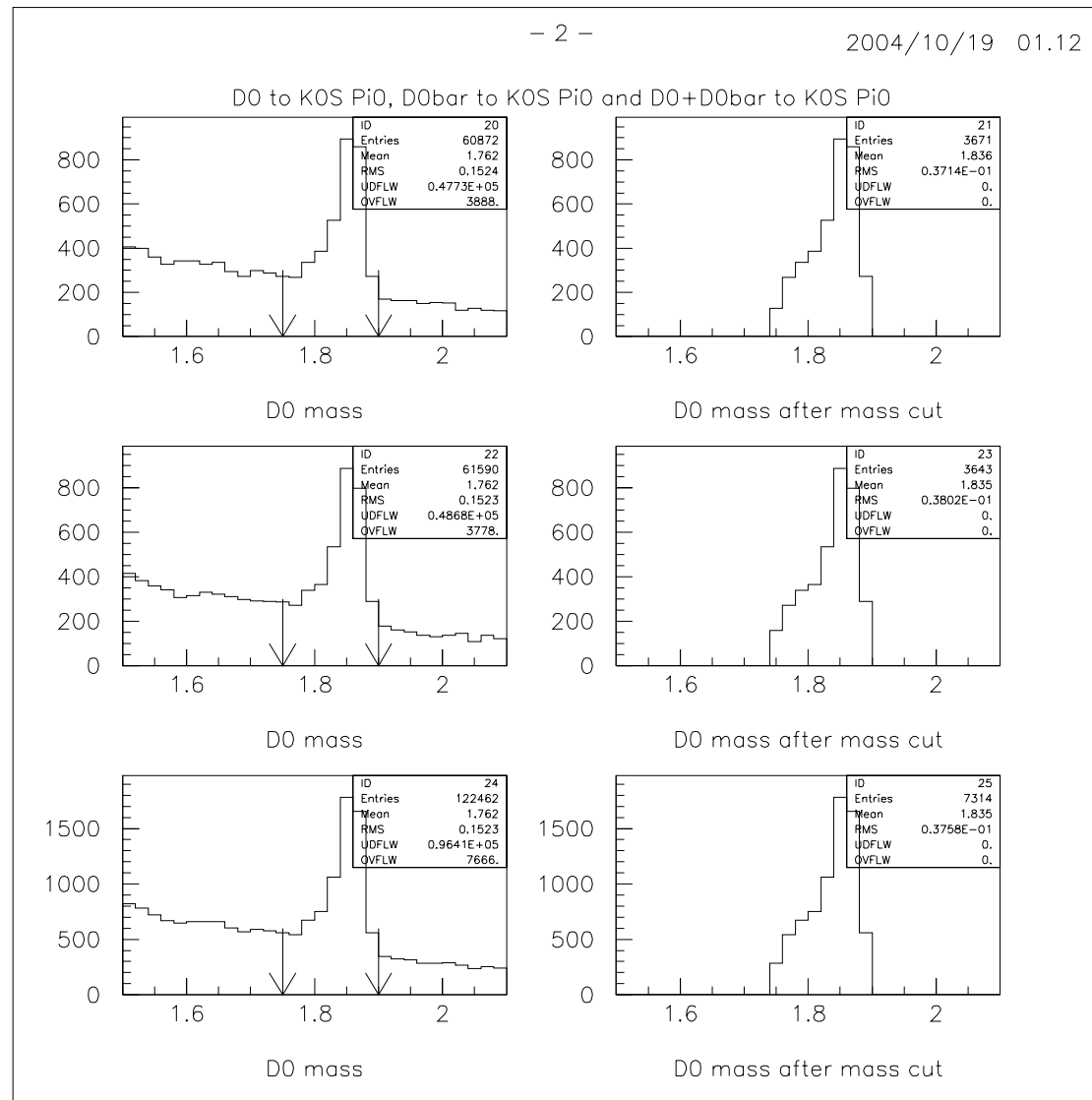
### Reconstruction Procedure:

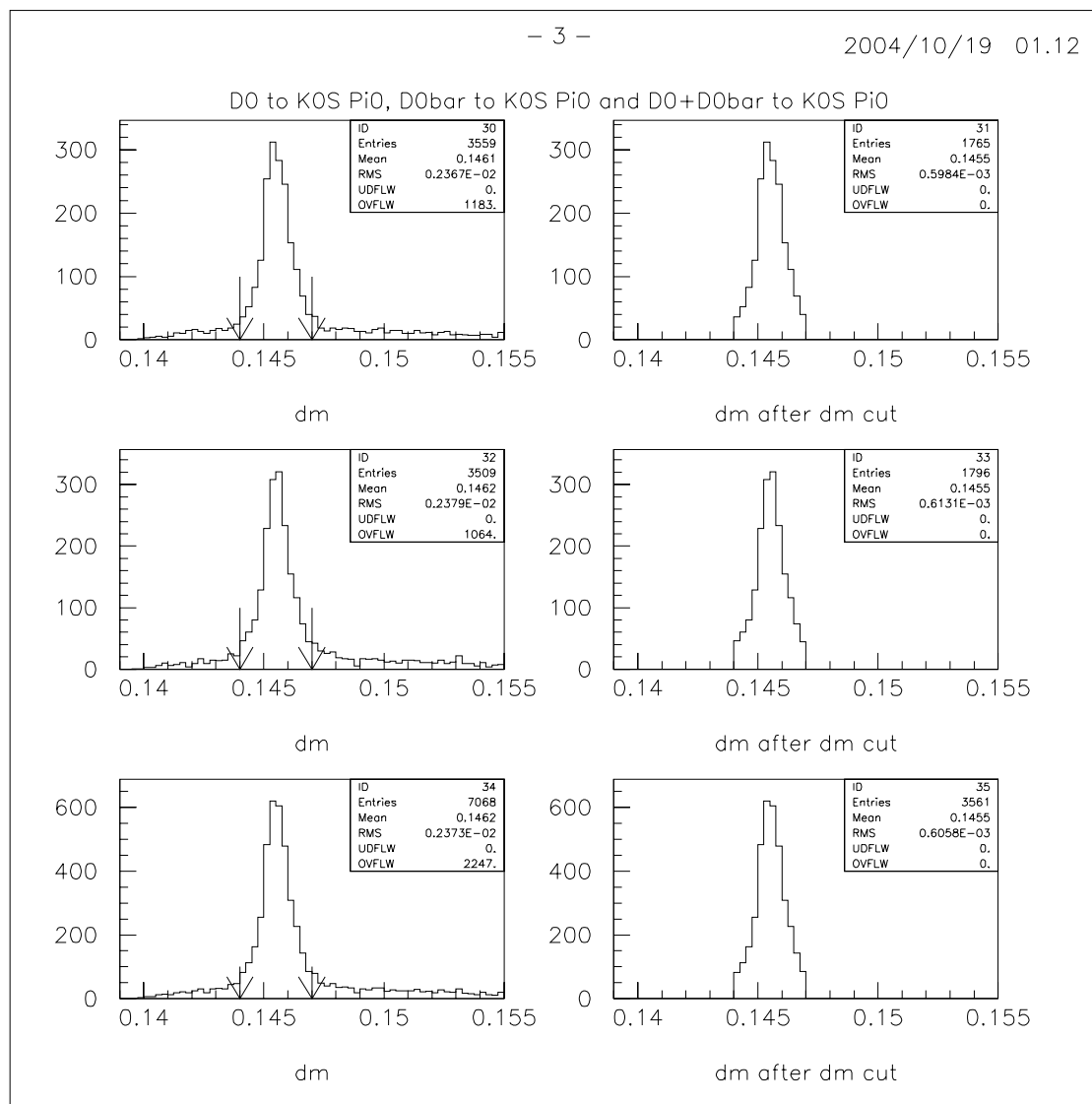
- $\pi^0$  made from mdstpi0
- $\pi^\pm$  made from mdstcharged
- $K_S$  made from mdstvee2
  - track, kind and mass cut ( $0.486\text{GeV} < M_{K_S} < 0.510\text{GeV}$ )
- $D^0/\bar{D}^0$  made from  $K_S$  and  $\pi^0$ 
  - flavour of  $D^0$  tagged by charge of  $\pi_{slow}$
  - mass cut ( $1.75\text{GeV} < M_{D^0} < 1.90\text{GeV}$ )
- $D^{*\pm}$  made from  $D^0/\bar{D}^0$  and  $\pi_{slow}^\pm$

– signal region is defined by

$$(0.144 < \delta M = M_{D^{*\pm}} - M_{D^0} / M_{\bar{D}^0} < 0.147)$$

Reconstructing  $D^0/\bar{D}^0 \rightarrow K_S\pi^0$ 

Reconstructing  $D^0/\bar{D}^0 \rightarrow K_S\pi^0$  conti....

Reconstructing  $D^0/\bar{D}^0 \rightarrow K_S\pi^0$  conti....

$D^0/\bar{D}^0 \rightarrow K_S\pi^0$  continues...

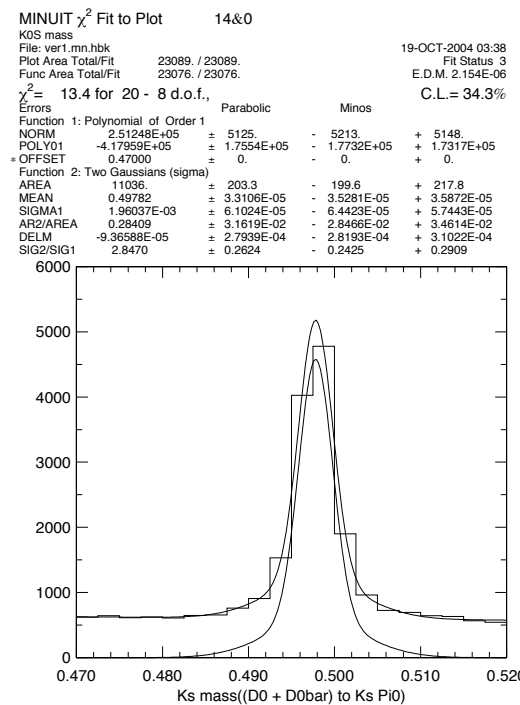
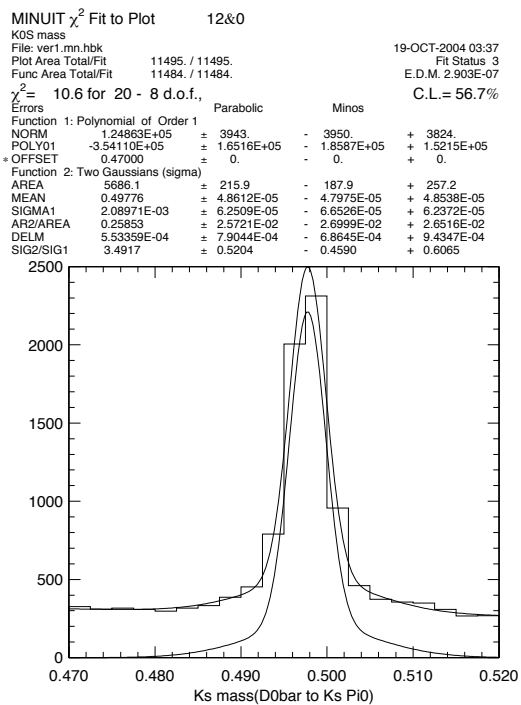
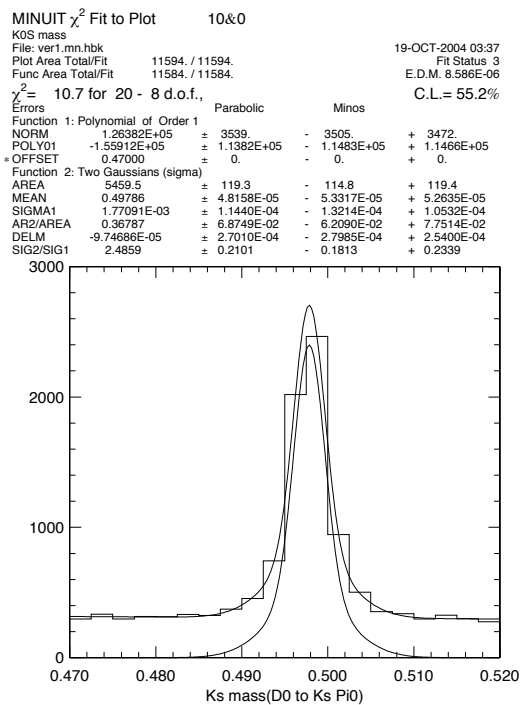
### Fitting Procedure:

- fitting functions has changed and improvement made
- $M_{K_S}$  distribution before cut on  $M_{K_S}$  fitted as follows
  - background fitted to 1st order polynomial  
offset fixed at 0.4700
  - signal fitted to 'Double Gaussian'
- $M_{D^0}$  distribution before cut on  $M_{D^0}$  fitted as follows
  - background fitted to falling exponential  
offset fixed at 1.5
  - signal fitted to 'Crystal Ball' function

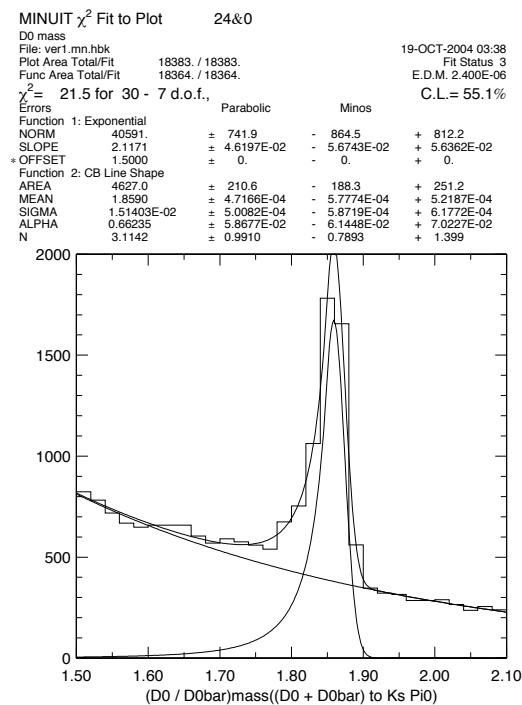
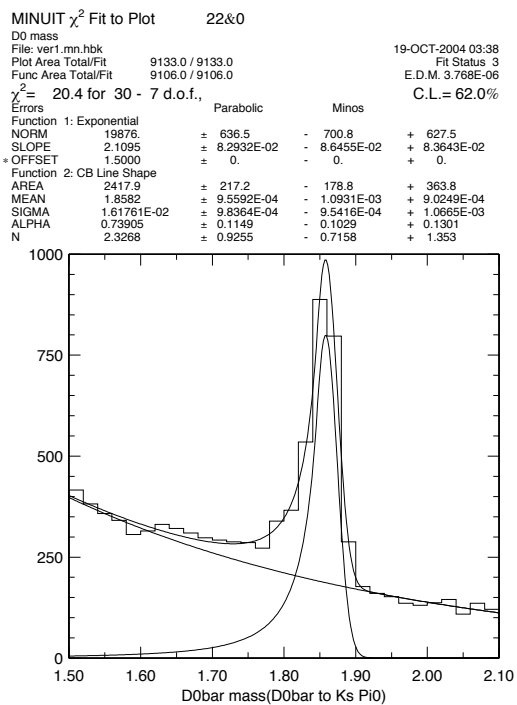
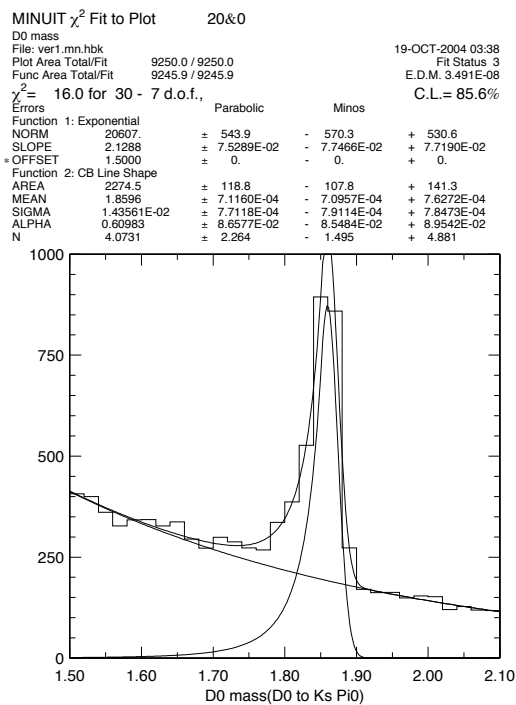
- $\delta M$  distribution before cut on  $\delta M$  fitted as follows
  - background fitted to threshold function  
offset fixed at  $M_{\pi^+} = 0.13957 GeV$
  - signal fitted to 'Double Gaussian'



# Fitting $M_{K_S}$

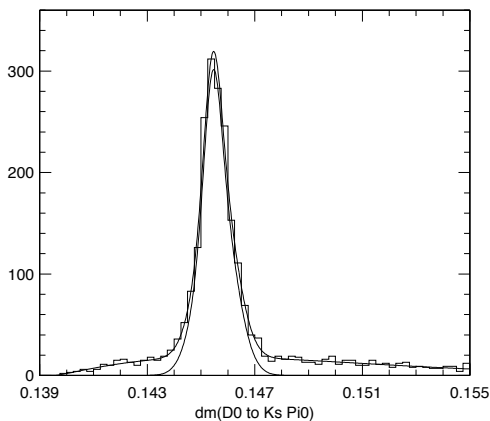


# Fitting $M_{D^0}/M_{\bar{D}^0}$

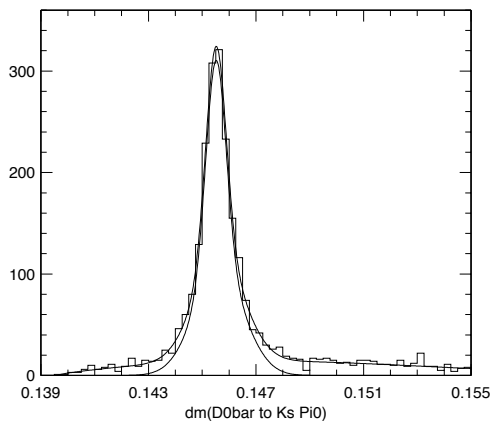


# Fitting $\delta M$

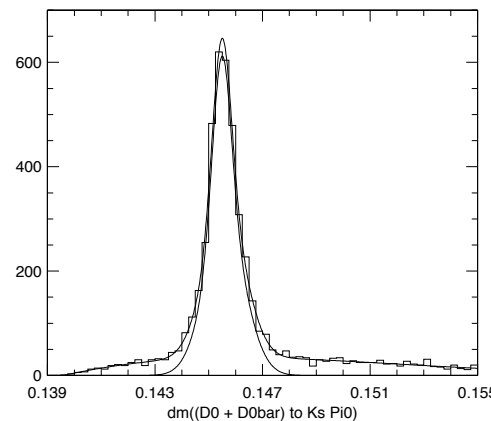
MINUIT  $\chi^2$  Fit to Plot 30&0  
 dm  
 File: ver1.mn.hbk 19-OCT-2004 03:40  
 Plot Area Total/Fit 2376.0 / 2376.0 Fit Status 3  
 Func Area Total/Fit 2342.4 / 2342.4 E.D.M. 3.126E-03  
 $\chi^2 = 32.8$  for 64 - 10 d.o.f., C.L. = 99.0%  
 Errors  
 Function 1: Threshold  
 NORM 1.52145E+08  $\pm$  1.6694E+08 - 0. + 0.  
 \*OFFSET 0.13957  $\pm$  0. - 0. + 0.  
 POWER 1.2694  $\pm$  0.1584 - 0. + 0.4814  
 COEFF1 -179.67  $\pm$  73.12 - 171.3 + 132.0  
 COEFF2 -2624.1  $\pm$  3587. - 5183. + 6266.  
 Function 2: Two Gaussians (sigma)  
 AREA 1578.0  $\pm$  48.18 - 49.80 + 48.62  
 MEAN 0.14559  $\pm$  3.1734E-05 - 2.9874E-05 + 3.6386E-05  
 SIGMA1 6.61211E-04  $\pm$  5.0580E-05 - 4.7219E-05 + 5.9550E-05  
 AR2/AREA 0.24541  $\pm$  0.1159 - 0.1039 + 0.1365  
 DELM -1.57690E-04  $\pm$  7.2462E-05 - 7.7083E-05 + 7.2759E-05  
 SIG2/SIG1 0.46406  $\pm$  7.9740E-02 - 9.4386E-02 + 7.7520E-02



MINUIT  $\chi^2$  Fit to Plot 32&0  
 dm  
 File: ver1.mn.hbk 19-OCT-2004 03:41  
 Plot Area Total/Fit 2445.0 / 2445.0 Fit Status 3  
 Func Area Total/Fit 2382.2 / 2382.2 E.D.M. 6.684E-06  
 $\chi^2 = 62.7$  for 64 - 10 d.o.f., C.L. = 19.5%  
 Errors  
 Function 1: Threshold  
 NORM 3.20601E+06  $\pm$  6.6745E+06 - 0. + 3.3757E+07  
 \*OFFSET 0.13957  $\pm$  0. - 0. + 0.  
 POWER 0.75510  $\pm$  0.2885 - 0. + 0.3497  
 COEFF1 13.329  $\pm$  131.0 - 95.70 + 0.  
 COEFF2 -7656.6  $\pm$  5452. - 0. + 5099.  
 Function 2: Two Gaussians (sigma)  
 AREA 1724.9  $\pm$  54.45 - 54.72 + 55.19  
 MEAN 0.14551  $\pm$  2.5305E-05 - 2.6158E-05 + 2.4855E-05  
 SIGMA1 3.74327E-04  $\pm$  4.6065E-05 - 4.7217E-05 + 4.4591E-05  
 AR2/AREA 0.54117  $\pm$  9.4111E-02 - 9.0734E-02 + 9.5174E-02  
 DELM 1.11049E-04  $\pm$  6.3081E-05 - 6.1210E-05 + 6.5777E-05  
 SIG2/SIG1 2.4800  $\pm$  0.1923 - 0.1890 + 0.2007



MINUIT  $\chi^2$  Fit to Plot 34&0  
 dm  
 File: ver1.mn.hbk 19-OCT-2004 03:39  
 Plot Area Total/Fit 4821.0 / 4821.0 Fit Status 3  
 Func Area Total/Fit 4773.1 / 4773.1 E.D.M. 7.014E-06  
 $\chi^2 = 47.8$  for 64 - 10 d.o.f., C.L. = 71.3%  
 Errors  
 Function 1: Threshold  
 NORM 5.76842E+07  $\pm$  8.0012E+07 - 0. + 2.9209E+08  
 \*OFFSET 0.13957  $\pm$  0. - 0. + 0.  
 POWER 1.0359  $\pm$  0.1972 - 0. + 0.2604  
 COEFF1 -95.874  $\pm$  82.54 - 87.21 + 0.  
 COEFF2 -4865.6  $\pm$  3437. - 0. + 3691.  
 Function 2: Two Gaussians (sigma)  
 AREA 3256.8  $\pm$  72.66 - 73.20 + 73.86  
 MEAN 0.14549  $\pm$  2.5890E-05 - 2.7317E-05 + 2.4906E-05  
 SIGMA1 3.44513E-04  $\pm$  3.9205E-05 - 3.8319E-05 + 4.0290E-05  
 AR2/AREA 0.63617  $\pm$  8.6756E-02 - 9.4090E-02 + 8.0021E-02  
 DELM 1.11743E-04  $\pm$  4.2576E-05 - 4.3029E-05 + 4.2682E-05  
 SIG2/SIG1 2.2080  $\pm$  0.1634 - 0.1541 + 0.1783



## Results from $D^0 \rightarrow K_L \pi^0$

Two solutions for  $p_{K_L}$  from  $D^0$  mass constraint studied:

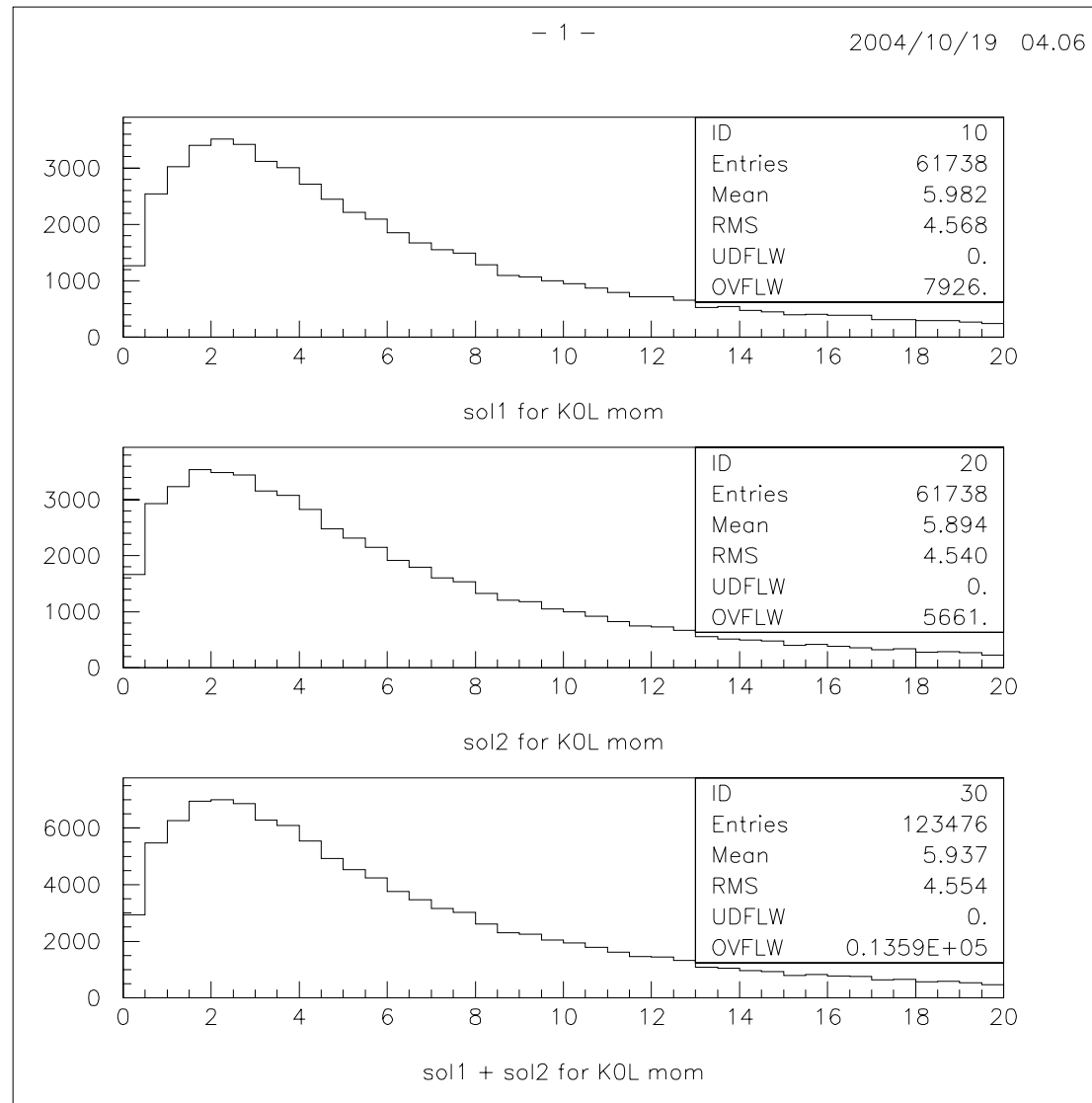
- calculated figure of merit (fom) in  $M_{D^{*+}}$

$$fom = \frac{S}{\sqrt{S+B}}, S = \int_{2.006531}^{2.013471} f_s(x) dx, B = \int_{2.006531}^{2.013471} f_b(x) dx$$

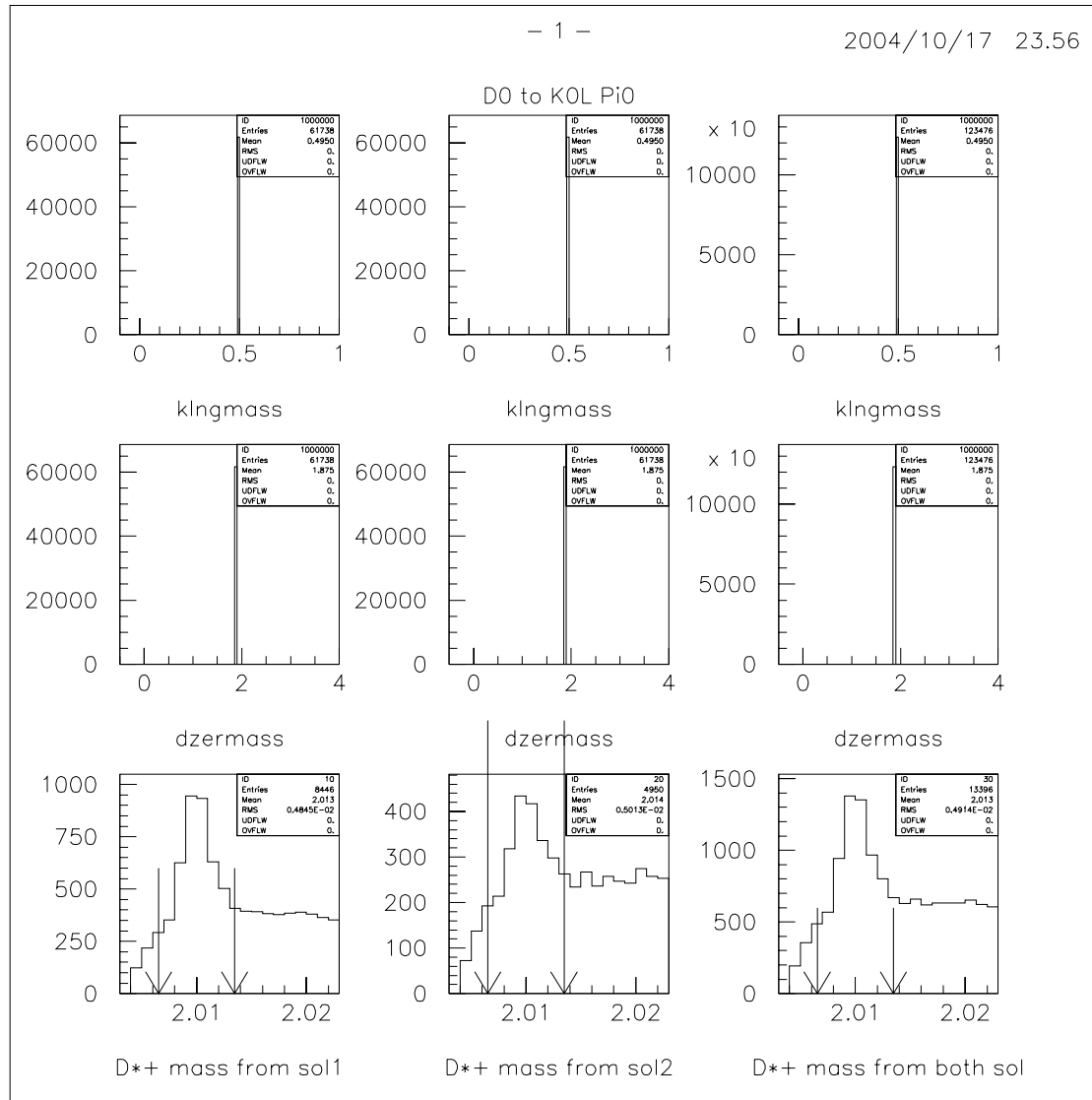
$f_s = \text{Gaussian}$   $f_b = \text{threshold function}$

- statistics:

Solutions	Signal	Background	fom
1	1750.8	2555.4	26.6802
2	620.21	1602.1	13.1564
Both	2402.8	4123.2	29.7436

Solutions for  $p_{KL}$ 

## Results from sol1, sol2 and two sols together



# fitting $M_{D^{*+}}$ for sol1, sol2 and two sols together for calculating fom

