

0

OUTLINE

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

Reconstruction and Fitting:

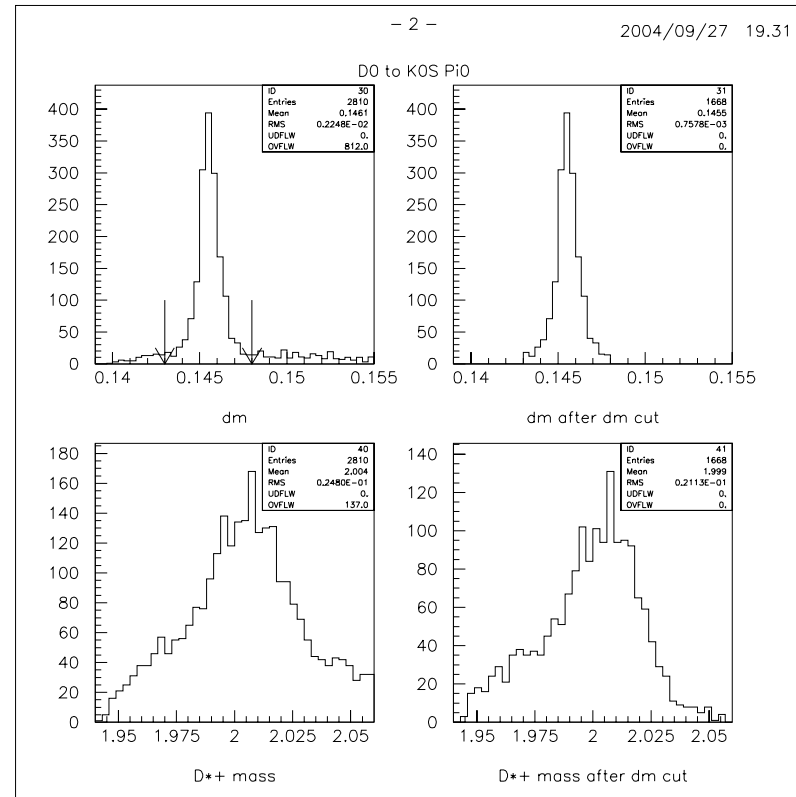
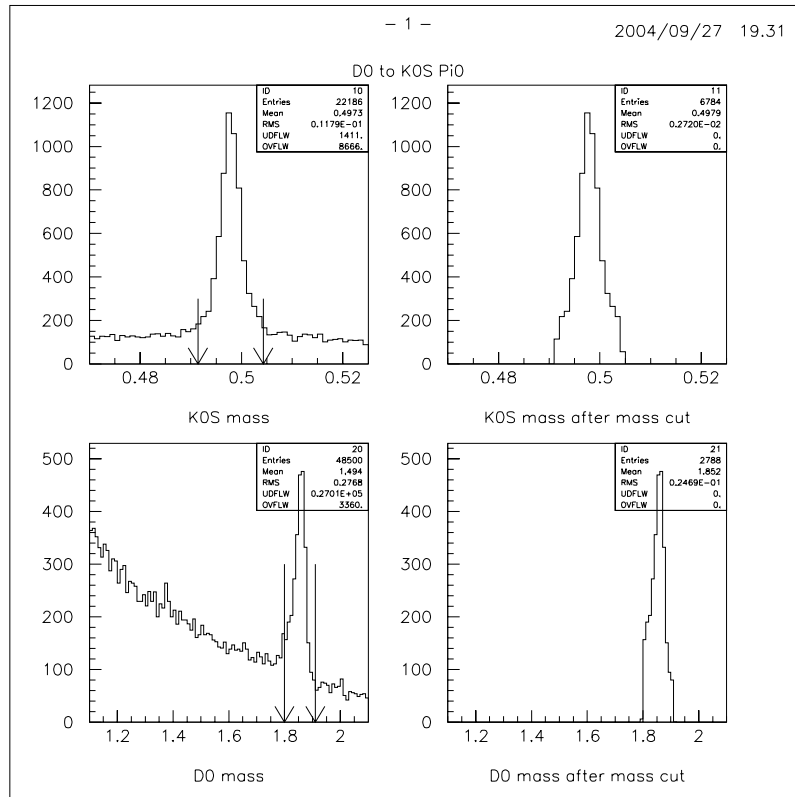
- $D^0 \rightarrow K_S \pi^0$
- $D^0 \rightarrow K_L \pi^0$
- $D^0 \rightarrow K_S \pi^+ \pi^-$
- $D^0 \rightarrow K_L \pi^+ \pi^-$

$$D^0 \rightarrow K_S \pi^0$$

Reconstruction Procedure:

- π^0 made from mdstpi0
- π^+ made from mdstcharged
- K_S made from mdstvee2
 - track and kind cut
 - mass cut, $\pm 3\sigma$ of mean in M_{K_S} distribution
- D^0 made from K_S and π^0
 - mass cut, $\pm 3\sigma$ of mean in M_{D^0} distribution
- D^{*+} made from D^0 and π_s^+

- where π_s^+ is π^+ - (π^+ used in making K_S) i.e. K_S veto on π^+
- signal region is defined by
($0.143 < dm = M_{D^{*+}} - M_{D^0} < 0.148$)

Reconstructing $D^0 \rightarrow K_S \pi^0$ 

$D^0 \rightarrow K_S \pi^0$ continues...

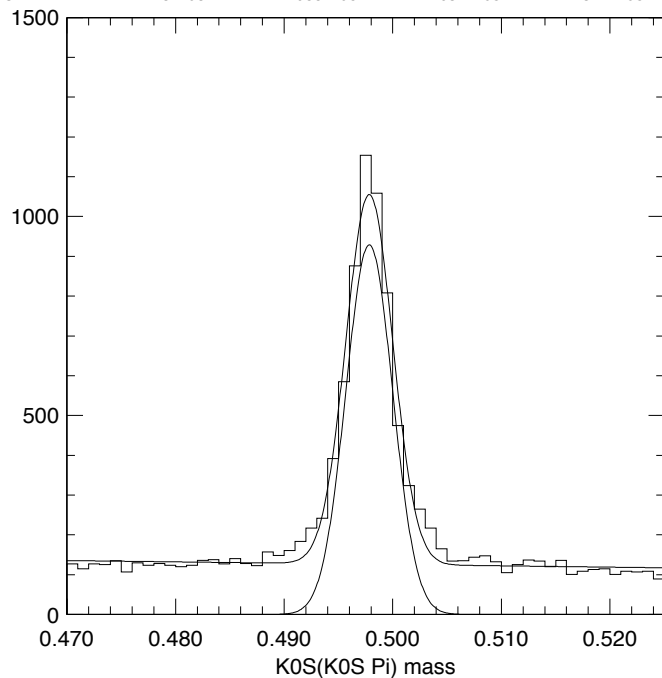
Fitting Procedure:

- M_{K_S} distribution before mass cut fitted as follows
 - background fitted to 1st order polynomial
offset fixed at 0.4700
 - signal fitted to Gaussian
- M_{D^0} distribution before mass cut fitted as follows
 - background fitted to falling exponential
offset fixed at 1.1
 - signal fitted to Gaussian
- 'dm' distribution before cut fitted as follows

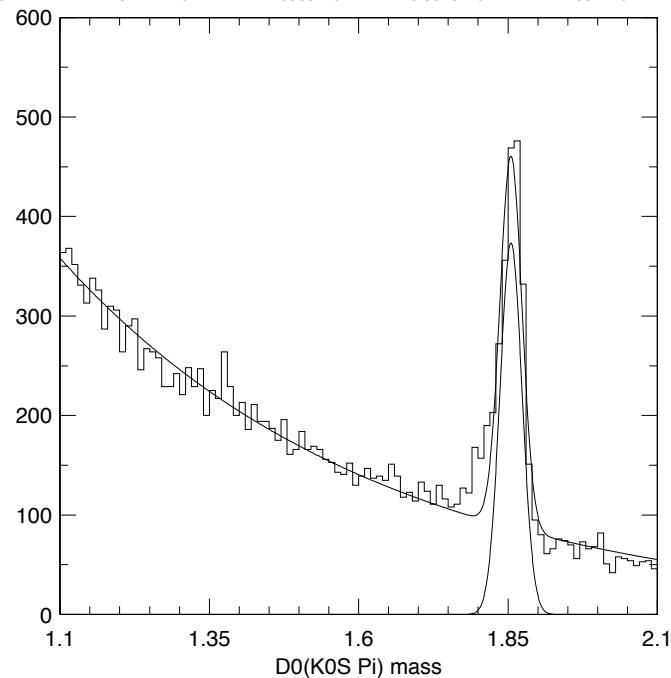
- background fitted to threshold function
offset fixed at $M_{\pi^+} = 0.13957 \text{ GeV}$
- signal fitted to double Gaussian
defines signal region for $\epsilon_{D^{*+}}$
- $M_{D^{*+}}$ distribution before mass cut fitted as follows
 - background fitted to threshold function
offset fixed at 1.9430 GeV
 - signal fitted to Gaussian

Fitting M_{K_S} and M_{D^0} in $D^0 \rightarrow K_S \pi^0$

MINUIT χ^2 Fit to Plot 10&0
 K0S mass
 File: ver4.mn.hbk 21-SEP-2004 22:58
 Plot Area Total/Fit 12109. / 12109. Fit Status 3
 Func Area Total/Fit 11953. / 11953. E.D.M. 2.203E-08
 $\chi^2 = 156.2$ for 55 - 5 d.o.f., C.L.=0.735E-10%
 Errors Parabolic Minos
 Function 1: Polynomial of Order 1
 NORM 1.35506E+05 \pm 3136. - 3141. + 3141.
 POLY01 -3.31521E+05 \pm 9.2523E+04 - 9.2689E+04 + 9.2689E+04
 * OFFSET 0.47000 \pm 0. - 0. + 0.
 Function 2: Gaussian (sigma)
 AREA 5001.4 \pm 83.21 - 84.06 + 84.12
 MEAN 0.49784 \pm 3.7415E-05 - 3.7992E-05 + 3.8008E-05
 SIGMA 2.14743E-03 \pm 4.1688E-05 - 4.1631E-05 + 4.2377E-05

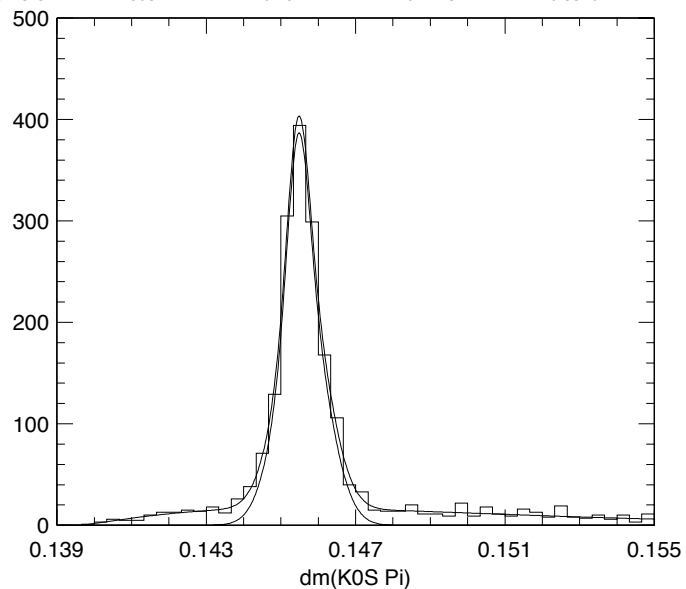


MINUIT χ^2 Fit to Plot 20&0
 D0 mass
 File: ver4.mn.hbk 21-SEP-2004 22:58
 Plot Area Total/Fit 18132. / 18132. Fit Status 3
 Func Area Total/Fit 17920. / 17920. E.D.M. 3.478E-08
 $\chi^2 = 212.6$ for 100 - 5 d.o.f., C.L.=0.552E-08%
 Errors Parabolic Minos
 Function 1: Exponential
 NORM 35811. \pm 473.6 - 464.0 + 466.5
 SLOPE 1.8706 \pm 3.2552E-02 - 3.0930E-02 + 3.1176E-02
 * OFFSET 1.1000 \pm 0. - 0. + 0.
 Function 2: Gaussian (sigma)
 AREA 1724.3 \pm 53.89 - 53.91 + 54.08
 MEAN 1.8550 \pm 7.2797E-04 - 7.3486E-04 + 7.1608E-04
 SIGMA 1.84211E-02 \pm 7.0359E-04 - 6.8615E-04 + 7.1394E-04

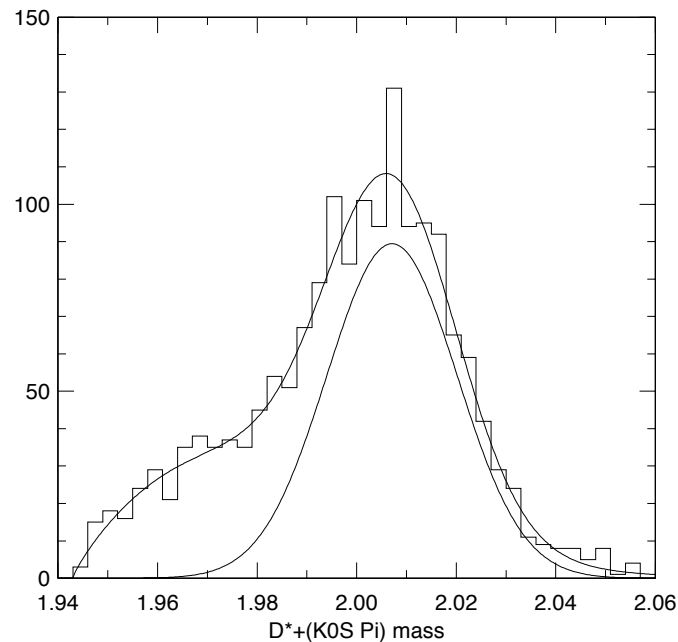


Fitting 'dm' and $M_{D^{*+}}$ in $D^0 \rightarrow K_S \pi^0$

MINUIT χ^2 Fit to Plot 30&0
 dm
 File: ver4.mn.hbk 21-SEP-2004 22:58
 Plot Area Total/Fit 1998.0 / 1998.0 Fit Status 3
 Func Area Total/Fit 1955.1 / 1955.1 E.D.M. 1.148E-04
 $\chi^2 = 42.8$ for 48 - 10 d.o.f., C.L.= 27.1%
 Errors Parabolic Minos
 Function 1: Threshold
 NORM 2.01596E+08 \pm 6.8983E+08 - 0. + 6.2153E+09
 * OFFSET 0.13957 \pm 0. - 0. + 0.
 POWER 1.3495 \pm 0.4876 - 0. + 0.
 COEFF1 -230.39 \pm 197.8 - 0. + 0.
 COEFF2 -543.33 \pm 7720. - 0. + 0.
 Function 2: Two Gaussians (sigma)
 AREA 1421.1 \pm 43.60 - 43.72 + 0.
 MEAN 0.14546 \pm 4.3382E-05 - 4.6649E-05 + 4.1544E-05
 SIGMA1 2.85123E-04 \pm 4.5437E-05 - 4.4493E-05 + 4.9198E-05
 AR2/AREA 0.74016 \pm 8.7290E-02 - 0.1019 + 7.8818E-02
 DELM 1.25759E-04 \pm 6.0081E-05 - 6.0139E-05 + 6.0132E-05
 SIG2/SIG1 2.2503 \pm 0.2944 - 0.2743 + 0.3320



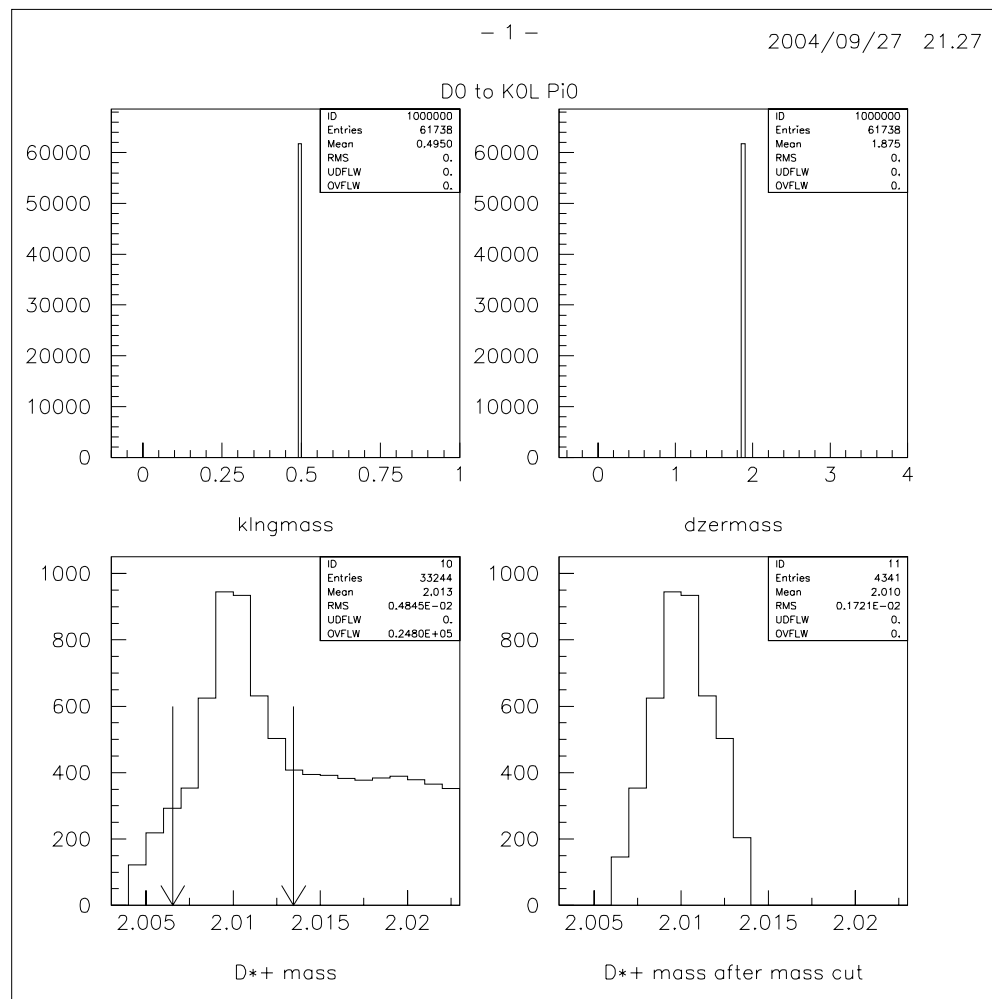
MINUIT χ^2 Fit to Plot 41&0
 D*+ mass after dm cut
 File: ver4.mn.hbk 21-SEP-2004 22:58
 Plot Area Total/Fit 1668.0 / 1668.0 Fit Status 3
 Func Area Total/Fit 1635.1 / 1635.1 E.D.M. 5.018E-06
 $\chi^2 = 33.6$ for 40 - 7 d.o.f., C.L.= 43.6%
 Errors Parabolic Minos
 Function 1: Threshold
 NORM 2.86314E+05 \pm 6.1596E+05 - 0. + 1.6087E+06
 * OFFSET 1.9430 \pm 0. - 0. + 0.
 POWER 0.81789 \pm 0.3691 - 0. + 0.3364
 COEFF1 -3.0453 \pm 40.70 - 0. + 0.
 COEFF2 -341.36 \pm 255.9 - 0. + 212.0
 Function 2: Gaussian (sigma)
 AREA 977.34 \pm 160.9 - 0. + 0.
 MEAN 2.0071 \pm 1.1537E-03 - 9.3440E-04 + 8.6188E-04
 SIGMA 1.30777E-02 \pm 1.1234E-03 - 0. + 9.7406E-04



$$D^0 \rightarrow K_L \pi^0$$

Reconstruction Procedure:

- π^0 made from mdstpi0
- π^+ made from mdstcharged
- K_L and D^0 made from mdstklong and π^0
 - D^0 and K_L mass constrained
 - imaginary solution for p_{K_L} rejected
- D^{*+} made from D^0 and π_s^+
 - where $\pi_s^+ = \text{all } \pi^+$, no veto on π^+
 - signal region is defined by $\pm 3\sigma$ of mean in $M_{D^{*+}}$ distribution

Reconstructing $D^0 \rightarrow K_L \pi^0$ 

$D^0 \rightarrow K_L \pi^0$ continues...

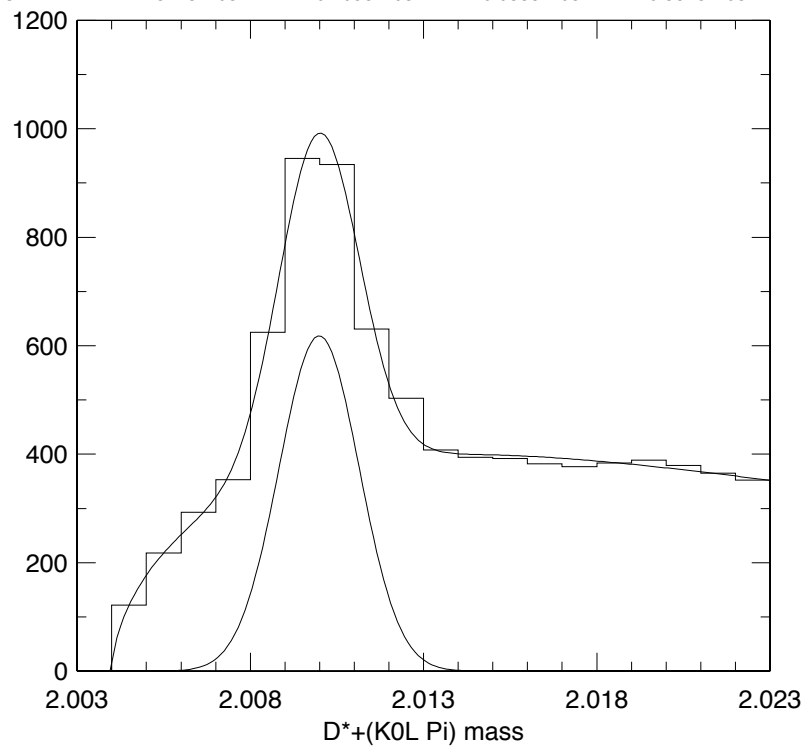
Fitting Procedure:

- $M_{D^{*+}}$ distribution before mass cut fitted as follows
 - background fitted to threshold function
offset fixed at 2.0040 GeV
 - signal fitted to Gaussian
defines signal region for $\epsilon_{D^{*+}}$

Fitting $M_{D^{*+}}$ in $D^0 \rightarrow K_L \pi^0$

MINUIT χ^2 Fit to Plot 10&0
 D*+ mass
 File: ver5.mn.hbk 21-SEP-2004 23:00
 Plot Area Total/Fit 8446.0 / 8446.0 Fit Status 3
 Func Area Total/Fit 8425.4 / 8425.4 E.D.M. 5.310E-06
 $\chi^2 = 9.5$ for 20 - 7 d.o.f., C.L. = 73.5%

Errors	Parabolic	Minos	
Function 1: Threshold			
NORM	1.06971E+07 ± 7.9746E+06	- 5.5999E+06	+ 1.1896E+07
* OFFSET	2.0040 ± 0.	- 0.	+ 0.
POWER	0.58492 ± 0.1047	- 0.1037	+ 0.1058
COEFF1	-61.353 ± 37.18	- 36.66	+ 36.99
COEFF2	191.03 ± 1135.	- 1123.	+ 1112.
Function 2: Gaussian (sigma)			
AREA	1793.2 ± 111.2	- 109.0	+ 113.8
MEAN	2.0100 ± 5.0858E-05	- 5.0548E-05	+ 5.1036E-05
SIGMA	1.15723E-03 ± 6.2098E-05	- 6.0555E-05	+ 6.3878E-05

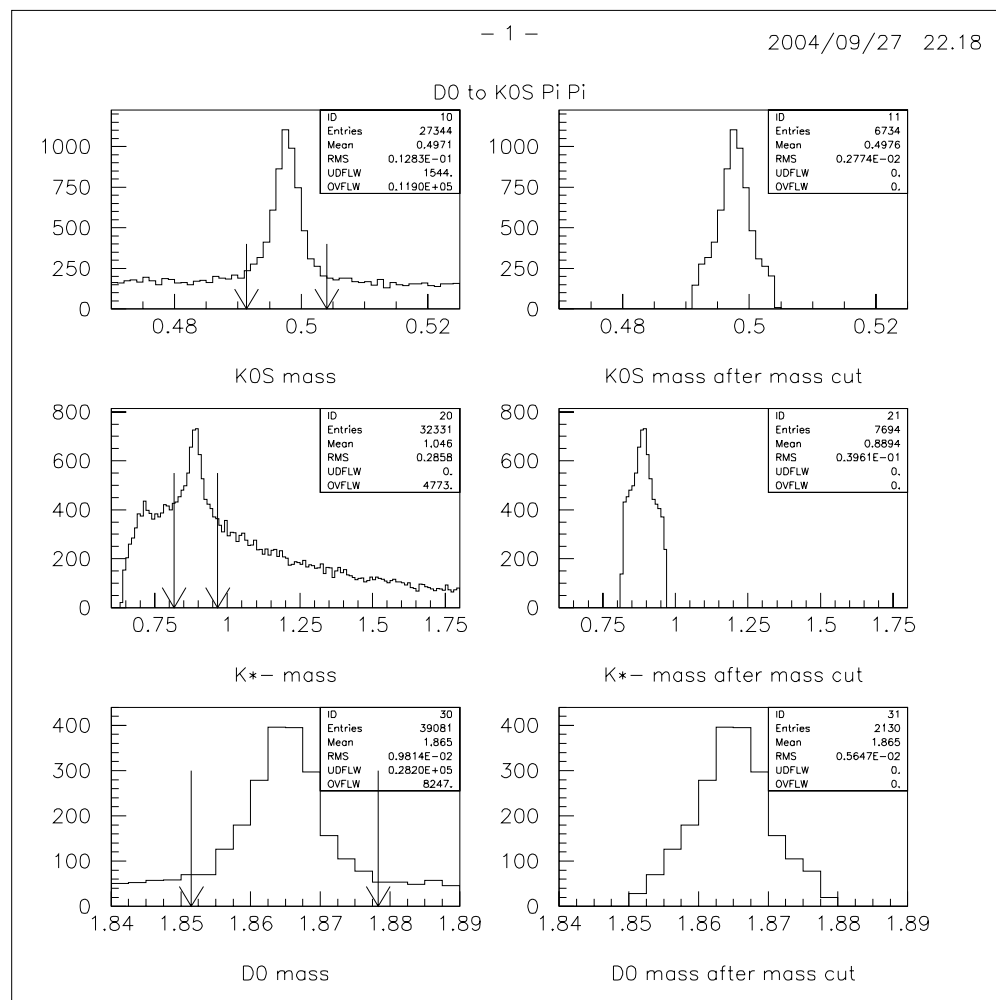


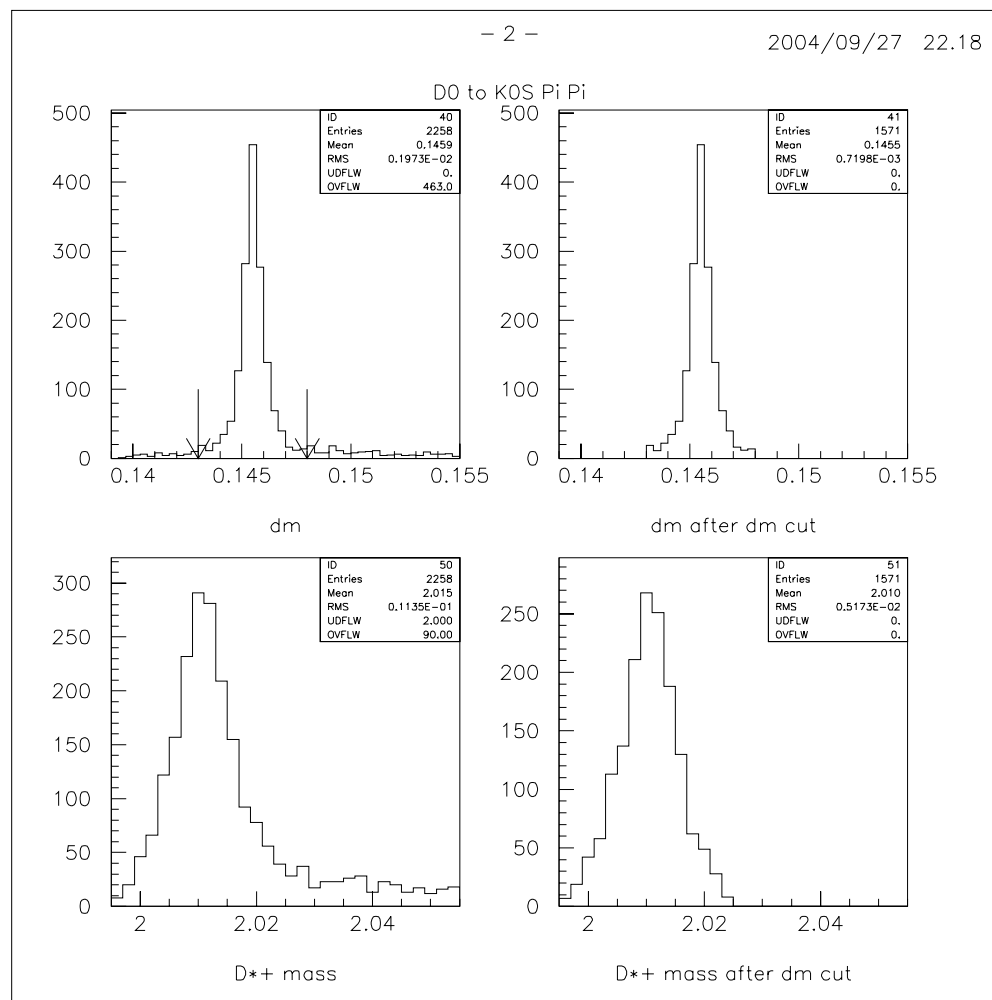
$$D^0 \rightarrow K_S \pi^+ \pi^-$$

Reconstruction Procedure:

- π^\pm made from mdstcharged
- K_S made from mdstvee2
 - track and kind cut
 - mass cut, $\pm 3\sigma$ of mean in M_{K_S} distribution
- K^{*-} made from K_S and π_c^-
 - where π_c^- is π^- with K_S veto on it
 - mass cut, $\pm 3\sigma$ of mean in $M_{K^{*-}}$ distribution
- D^0 made from K^{*-} and π_c^+
 - where π_c^+ is π^+ with K_S veto on it

- mass cut, $\pm 3\sigma$ of mean in M_{D^0} distribution
- D^{*+} made from D^0 and π_s^+
 - where π_s^+ is π^+ with K_S and D^0 veto on it
 - signal region is defined by $(0.143 < dm < 0.148)$

Reconstructing $D^0 \rightarrow K_S \pi^+ \pi^-$ 

Reconstructing $D^0 \rightarrow K_S \pi^+ \pi^-$ continues....

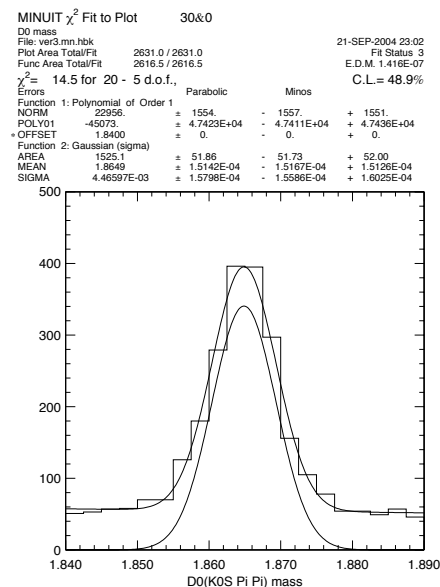
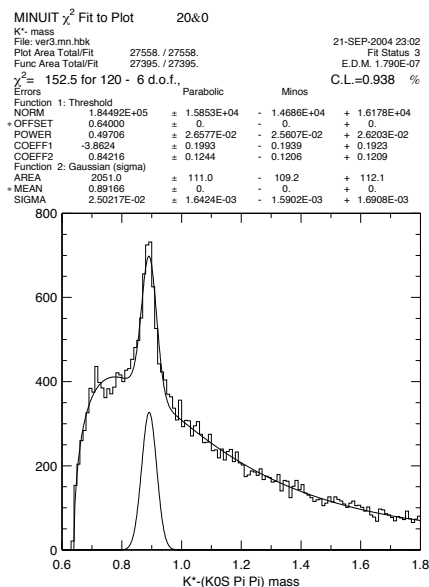
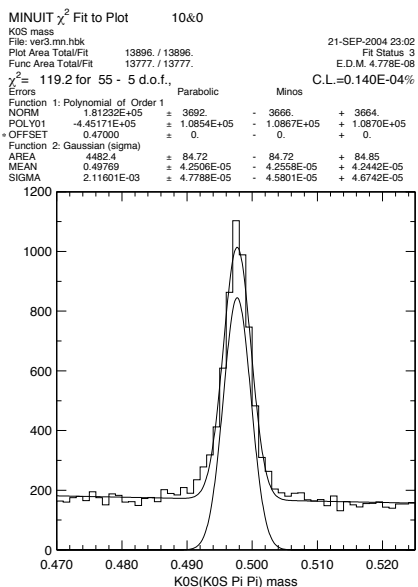
$$D^0 \rightarrow K_S \pi^+ \pi^- \text{ continues...}$$

Fitting Procedure:

- M_{K_S} distribution before mass cut fitted as follows
 - background fitted to 1st order polynomial
offset fixed at 0.470
 - signal fitted to Gaussian
- $M_{K^{*-}}$ distribution before mass cut fitted as follows
 - background fitted to threshold function
offset fixed at 0.6400
 - signal fitted to Gaussian
mean fixed at 0.89166 GeV, PDG mass of K^{*-}
- M_{D^0} distribution before mass cut fitted as follows

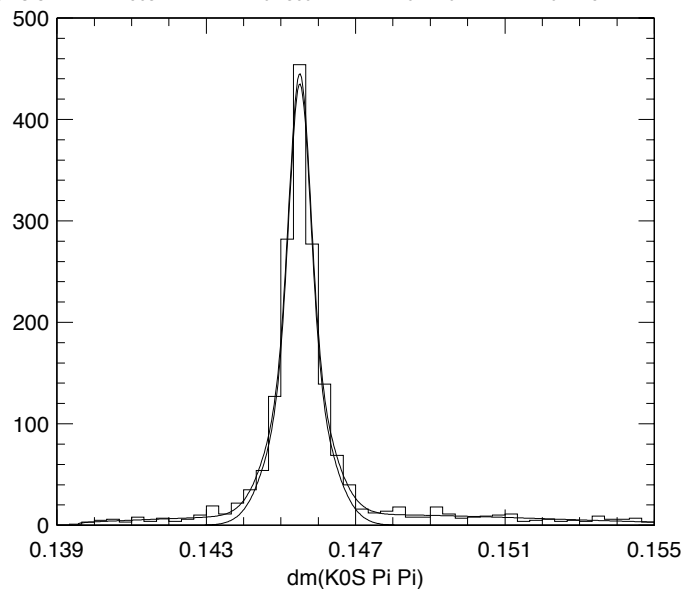
- background fitted to first order polynomial
offset fixed at 1.8400
- signal fitted to Gaussian
- **'dm' distribution before cut fitted as follows**
 - background fitted to threshold function
offset fixed at $M_{\pi^+} = 0.13957 \text{ GeV}$
 - signal fitted to double Gaussian
difference in mean fixed to zero
defines signal region for $\epsilon_{D^{*+}}$
- **$M_{D^{*+}}$ distribution before mass cut fitted as follows**
 - background fitted to threshold function
offset fixed at 1.9960 GeV
 - signal fitted to Gaussian

Fitting $M_{K_S}, M_{K^{*-}}$ and M_{D^0} in $D^0 \rightarrow K_S \pi^+ \pi^-$

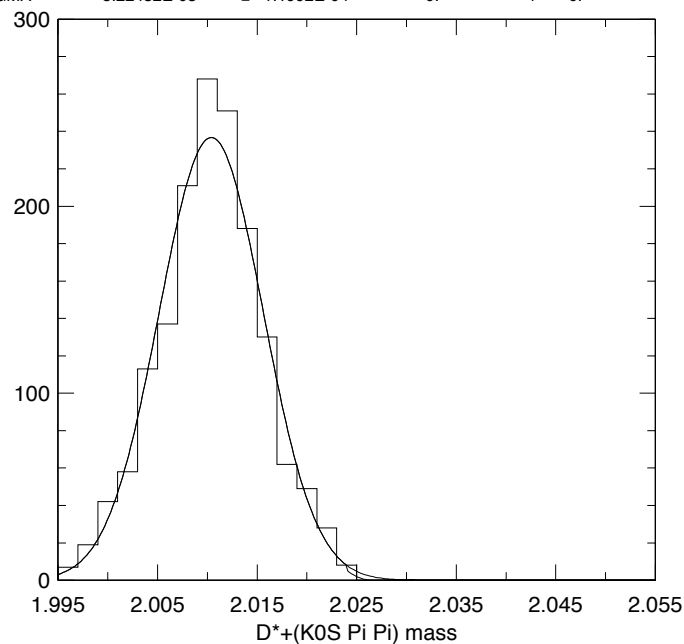


Fitting 'dm' and $M_{D^{*+}}$ in $D^0 \rightarrow K_S \pi^+ \pi^-$

MINUIT χ^2 Fit to Plot 40&0
 dm
 File: ver3.mn.hbk 21-SEP-2004 23:03
 Plot Area Total/Fit 1795.0 / 1795.0 Fit Status 3
 Func Area Total/Fit 1755.6 / 1755.6 E.D.M. 2.461E-05
 $\chi^2 = 39.9$ for 48 - 9 d.o.f., C.L.= 43.1%
 Errors Parabolic Minos
 Function 1: Threshold
 NORM 32631. $\pm 1.1473E+05$ - 0. + 6.8313E+05
 * OFFSET 0.13957 $\pm 0.$ - 0. + 0.
 POWER 0.16477 ± 0.4849 - 0. + 0.4429
 COEFF1 236.98 ± 236.4 - 0. + 0.
 COEFF2 -17696. $\pm 1.0468E+04$ - 0. + 7414.
 Function 2: Two Gaussians (sigma)
 AREA 1405.7 ± 42.96 - 42.85 + 42.96
 MEAN 0.14551 $\pm 1.3936E-05$ - 1.3880E-05 + 1.3915E-05
 SIGMA1 2.80317E-04 $\pm 4.1506E-05$ - 3.7736E-05 + 4.2909E-05
 AR2/AREA 0.57985 $\pm 9.9511E-02$ - 0.1058 + 9.0990E-02
 * DELM 0. $\pm 0.$ - 0. + 0.
 SIG2/SIG1 2.4963 ± 0.2360 - 0.2210 + 0.2478



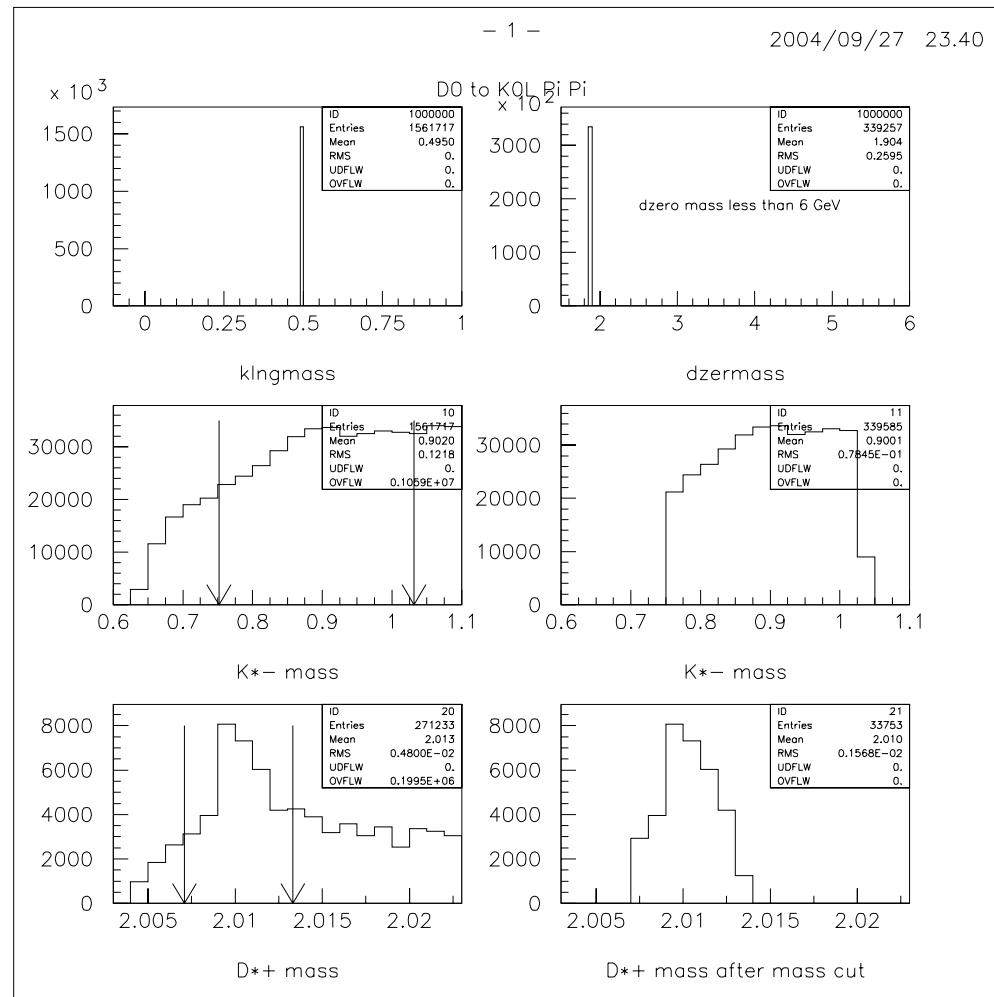
MINUIT χ^2 Fit to Plot 51&0
 D*+ mass after dm cut
 File: ver3.mn.hbk 21-SEP-2004 23:03
 Plot Area Total/Fit 1571.0 / 1571.0 Fit Status 3
 Func Area Total/Fit 1542.3 / 1542.3 E.D.M. 0.662
 $\chi^2 = 26.8$ for 30 - 7 d.o.f., C.L.= 26.6%
 Errors Parabolic Minos
 Function 1: Threshold
 NORM -21.181 ± 190.4 - 0. + 0.
 * OFFSET 1.9960 $\pm 0.$ - 0. + 0.
 POWER 12.833 ± 1.796 - 0. + 0.
 COEFF1 3881.4 $\pm 2.8350E-02$ - 0. + 0.
 COEFF2 -74846. $\pm 6612.$ - 0. + 0.
 Function 2: Gaussian (sigma)
 AREA 1550.5 ± 39.51 - 0. + 0.
 MEAN 2.0104 $\pm 1.3619E-04$ - 0. + 0.
 SIGMA 5.22432E-03 $\pm 1.1992E-04$ - 0. + 0.



$$D^0 \rightarrow K_L \pi^+ \pi^-$$

Reconstruction Procedure:

- π^\pm made from mdstcharged
- K_L , K^{*-} and D^0 made from mdstklong, π^+ and π^-
 - D^0 and K_L mass constrained
 - imaginary solution for p_{K_L} rejected
 - K^{*-} made from K_L and π^-
mass cut, $\pm 3\sigma$ of mean in $M_{K^{*-}}$ distribution
 - D^0 made from K^{*-} and π^+
- D^{*+} made from D^0 and π_s^+
 - where $\pi_s^+ = \pi^+$ with D^0 veto on it
 - signal region is defined by $\pm 3\sigma$ of mean in $M_{D^{*+}}$ distribution

Reconstructing $D^0 \rightarrow K_L \pi^+ \pi^-$ 

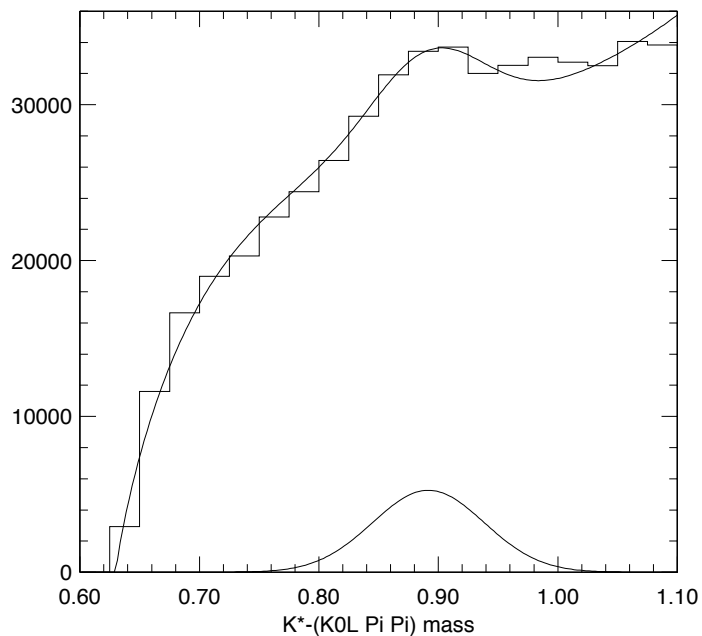
$$D^0 \rightarrow K_L \pi^+ \pi^- \text{ continues...}$$

Fitting Procedure:

- $M_{K^{*-}}$ distribution before mass cut fitted as follows
 - background fitted to threshold function
offset fixed at 0.6300 GeV
 - signal fitted to Gaussian
mean fixed at 0.89166 GeV, PDG mass of K^{*-}
- $M_{D^{*+}}$ distribution before mass cut fitted as follows
 - background fitted to threshold function
offset fixed at 2.0040 GeV
 - signal fitted to Gaussian
defines signal region for $\epsilon_{D^{*+}}$

Fitting M_{K^*-} and M_{D^*+} in $D^0 \rightarrow K_L \pi^+ \pi^-$

MINUIT χ^2 Fit to Plot 10&0
 K* mass
 File: ver2.mn.hbk 21-SEP-2004 23:04
 Plot Area Total/Fit 5.03092E+05 / 5.03092E+05 Fit Status 3
 Func Area Total/Fit 5.02236E+05 / 5.02236E+05 E.D.M. 4.286E-07
 $\chi^2 = 531.5$ for 20 - 6 d.o.f., C.L.= 0. %
 Errors
 Function 1: Threshold
 NORM 9.14186E+06 ± 4.0512E+05 - 3.6508E+05 + 3.8393E+05
 * OFFSET 0.63000 ± 0. - 0. + 0.
 POWER 0.85134 ± 1.0843E-02 - 1.0105E-02 + 1.0192E-02
 COEFF1 -4.9470 ± 0.2383 - 0.2201 + 0.2149
 COEFF2 5.0370 ± 0.3747 - 0.3371 + 0.3477
 Function 2: Gaussian (sigma)
 AREA 24600. ± 2135. - 1928. + 2090.
 * MEAN 0.89166 ± 0. - 0. + 0.
 SIGMA 4.66589E-02 ± 2.3724E-03 - 2.2522E-03 + 2.2972E-03



MINUIT χ^2 Fit to Plot 20&0
 D*+ mass
 File: ver2.mn.hbk 21-SEP-2004 23:04
 Plot Area Total/Fit 71708. / 71708. Fit Status 3
 Func Area Total/Fit 70948. / 70948. E.D.M. 2.633E-07
 $\chi^2 = 672.2$ for 20 - 7 d.o.f., C.L.= 0. %
 Errors
 Function 1: Threshold
 NORM 3.69583E+08 ± 8.4061E+07 - 7.7909E+07 + 9.9974E+07
 * OFFSET 2.0040 ± 0. - 0. + 0.
 POWER 0.78361 ± 3.2638E-02 - 3.4068E-02 + 3.4566E-02
 COEFF1 -111.68 ± 11.30 - 11.53 + 11.48
 COEFF2 1012.0 ± 361.8 - 359.6 + 360.1
 Function 2: Gaussian (sigma)
 AREA 11809. ± 276.2 - 279.5 + 283.5
 MEAN 2.0102 ± 2.0604E-05 - 2.0501E-05 + 2.0610E-05
 SIGMA 1.03601E-03 ± 2.1606E-05 - 2.1589E-05 + 2.2074E-05

