

# Update on $D^0$ search

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# Status

Result shown at QM02 (Nantes)

New version in Ph. D. thesis

Shown now: plots from thesis,  
compared to QM02 when necessary

Continue for publication? (As a letter)

# Cuts

## thesis analysis

- $n_{\text{point}} \geq 30$
- $n_{\text{max\_point}}[0] - n_{\text{point}}[0] \leq 20$
- kaon dE/dx PID cut for particles with  $y_{\text{K}} \geq 2.9$ ,  
 $n_{\text{dedx\_point}}[2] \geq 30$ ,  $p < 30 \text{ GeV}$

4 samples: kaon with and without PID,  $D^0$  and anti- $D^0$

## dE/dx performance

Difference between 96 and 2000 data:  
512/256 timeslices and  
reconstruction procedure

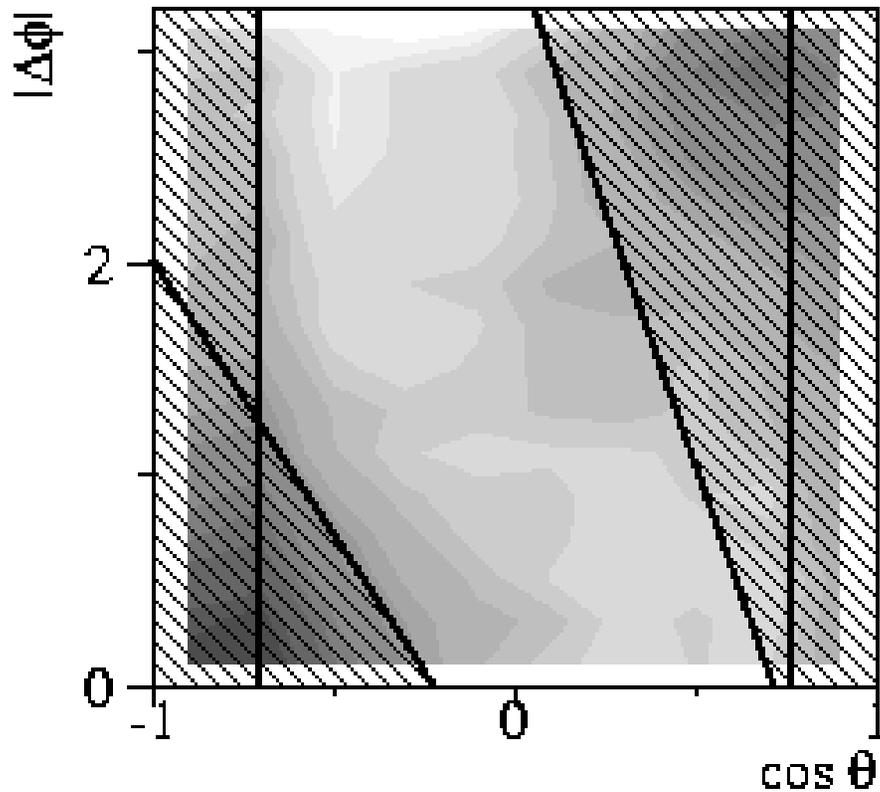
Result:

- MTPC dE/dx slightly worse resolution for year 2000
- VTPC, global dE/dx better

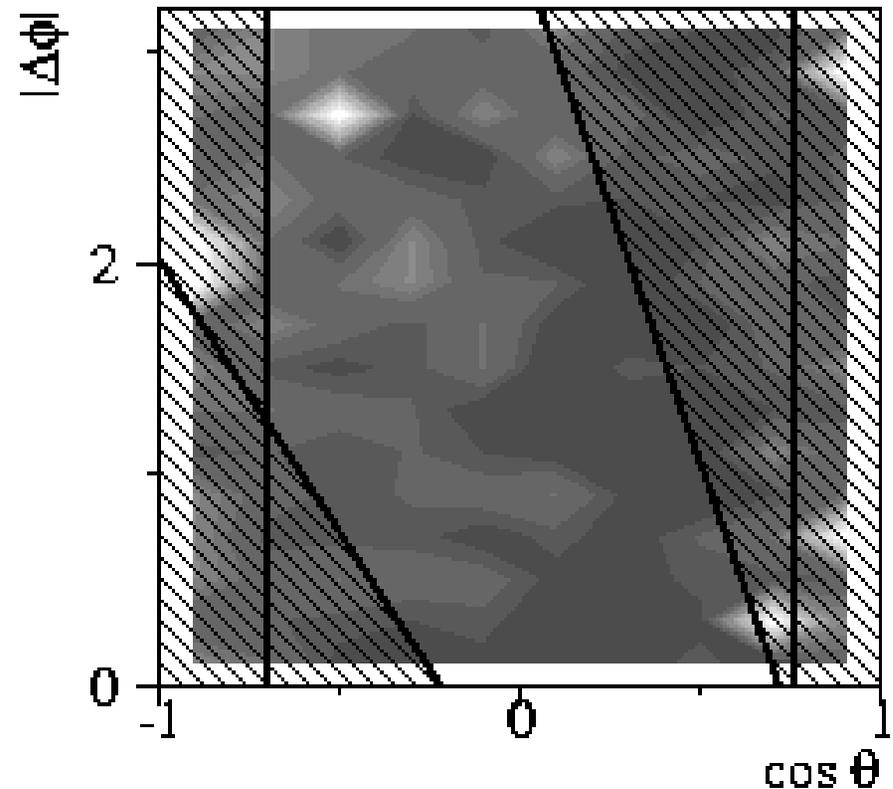
Global dE/dx used for year 2000,  
MTPC for 1996 data

# Pair cuts

Background (data)



Signal (MC)



$D^0$  decay angles in rest frame:  
 $\theta$  polar angle between K and beam direction,  
 $\Delta\phi$  angle between  $D^0$  and K in transverse plane

Cut optimised in bins of  $p_t$  and separately  
for sample with/without PID

[candidate plot for paper](#)

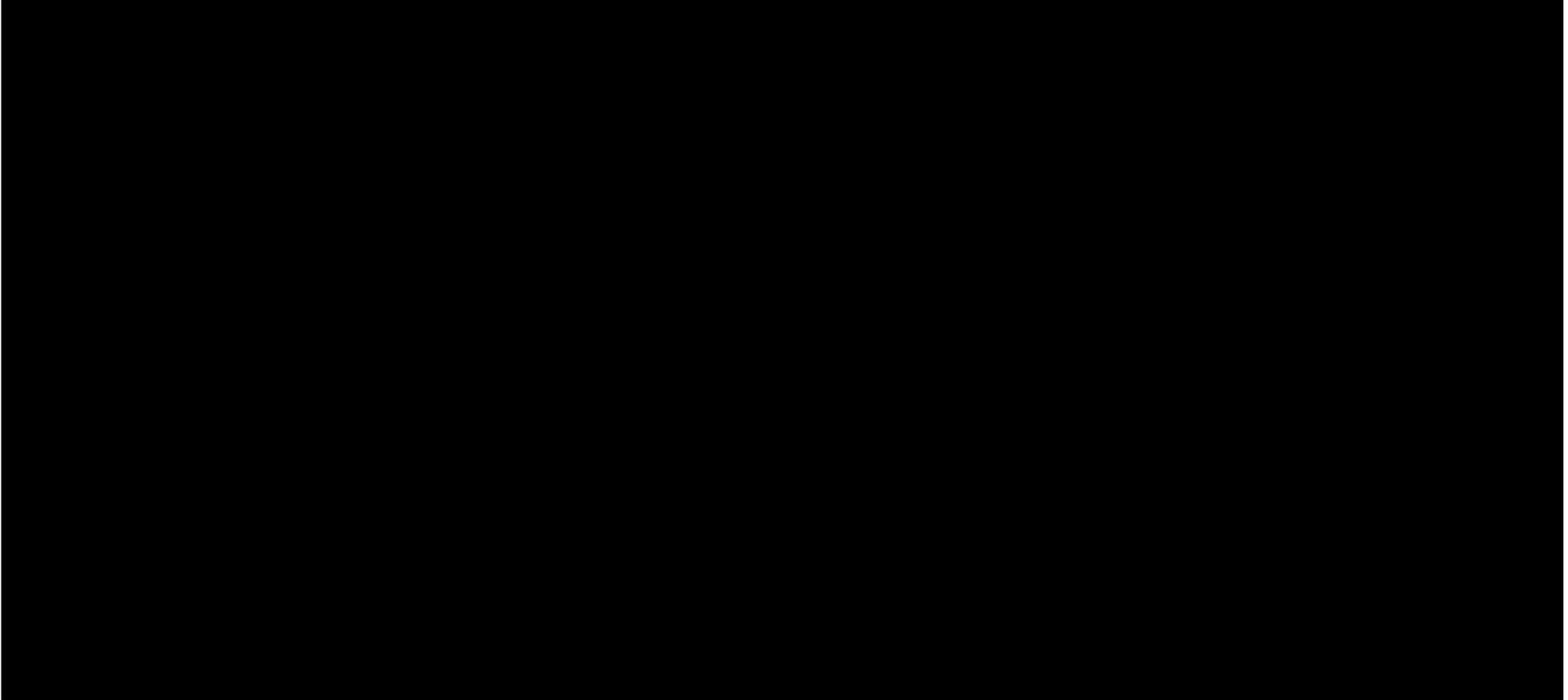
# Acceptance \* efficiency

without PID (low momentum kaons)

with PID (MTPC kaons)

candidate plot for paper

# Expected $y$ - $p_t$ distributions



Histograms, solid lines: PYTHIA

dashed line: alternative, 'thermal' hypothesis  $T=300$  MeV,  $\sigma=0.6$

Average efficiency relatively insensitive to shapes of these distributions

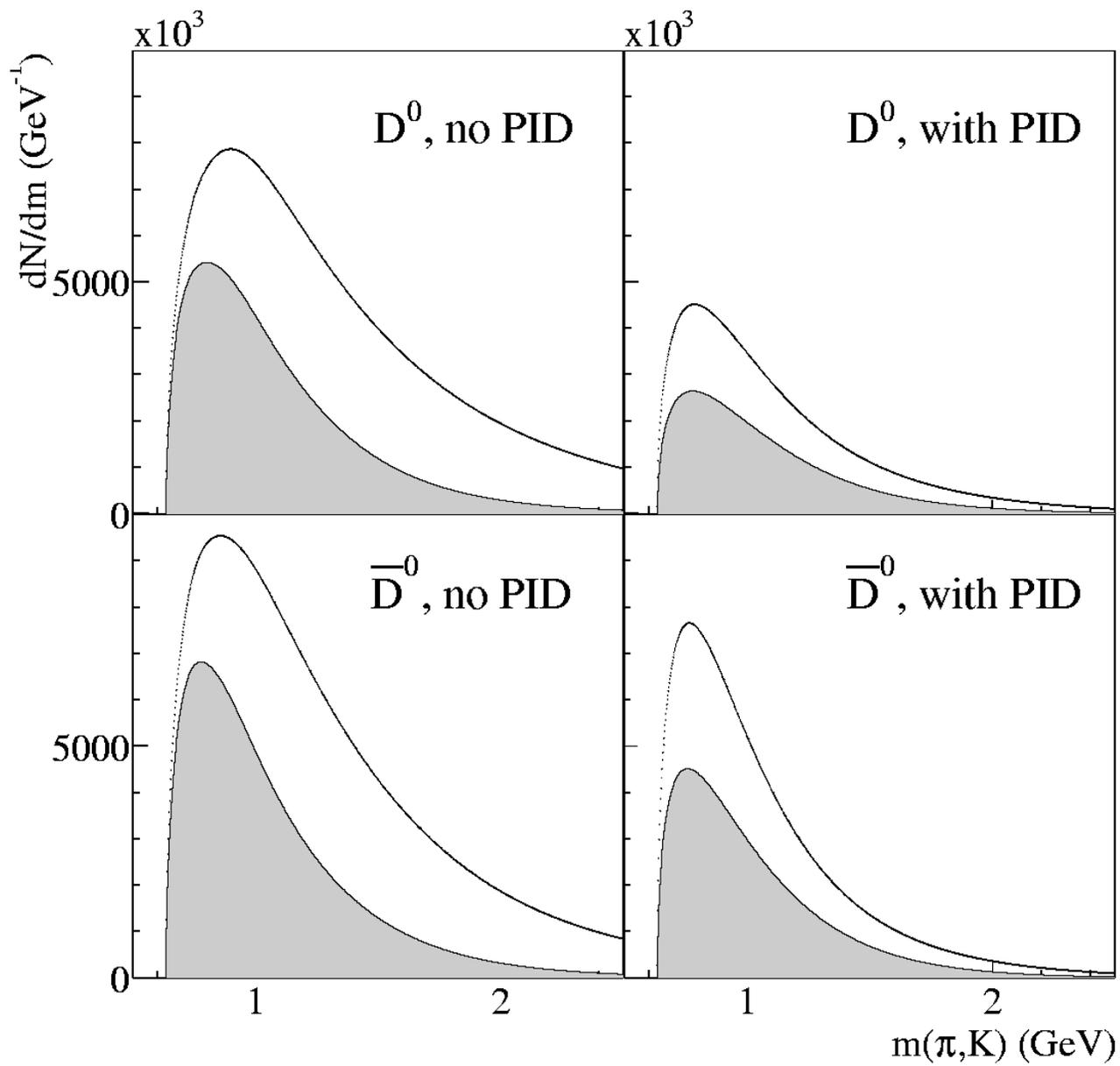
# Mass resolution

Many improvements in embedding procedure (thanks to Christoph)

New situation: Mass resolution in embedding and MC-only similar.

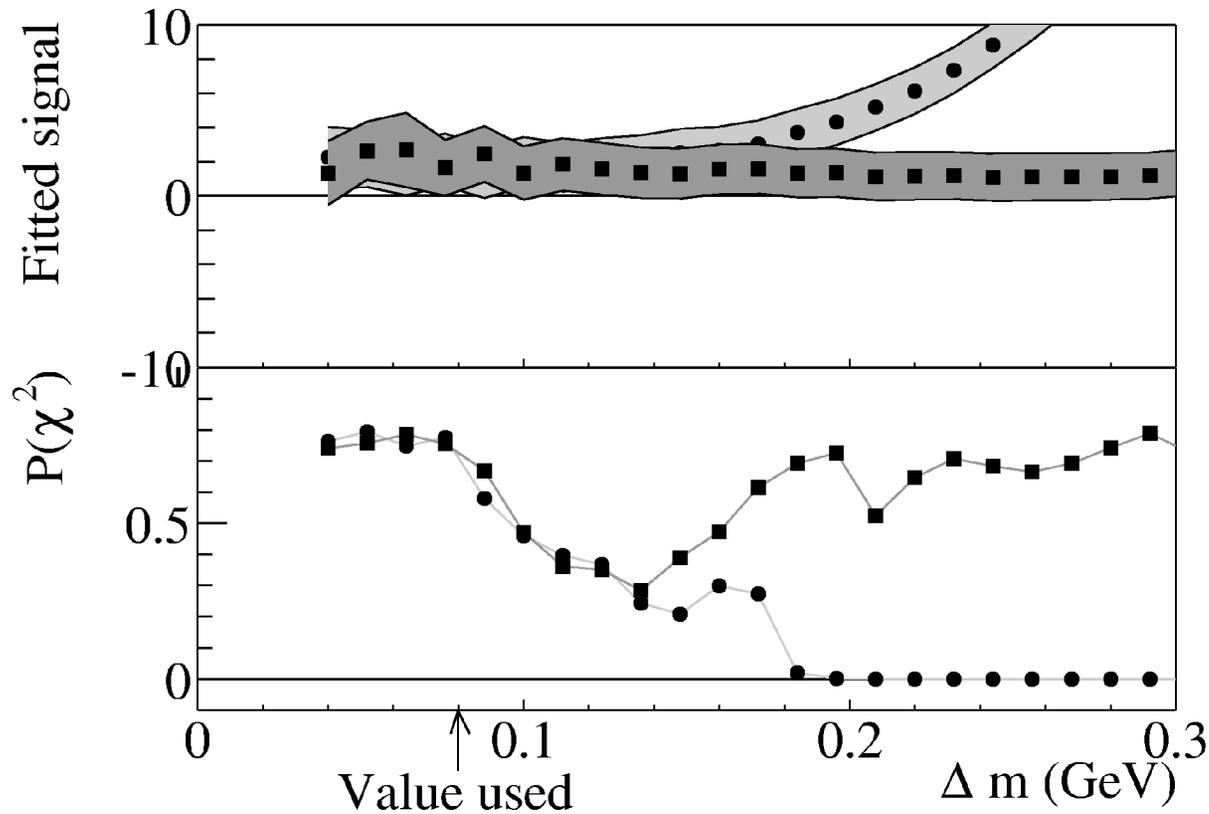
QM02:  $\Gamma$  approx 11 MeV  
(before improvements)

New procedure is certainly more correct, but what about track density effects/uncertainty in mag. field?



Effect of pair cut  
(efficiency corrected)

# Dependence of signal on mass range

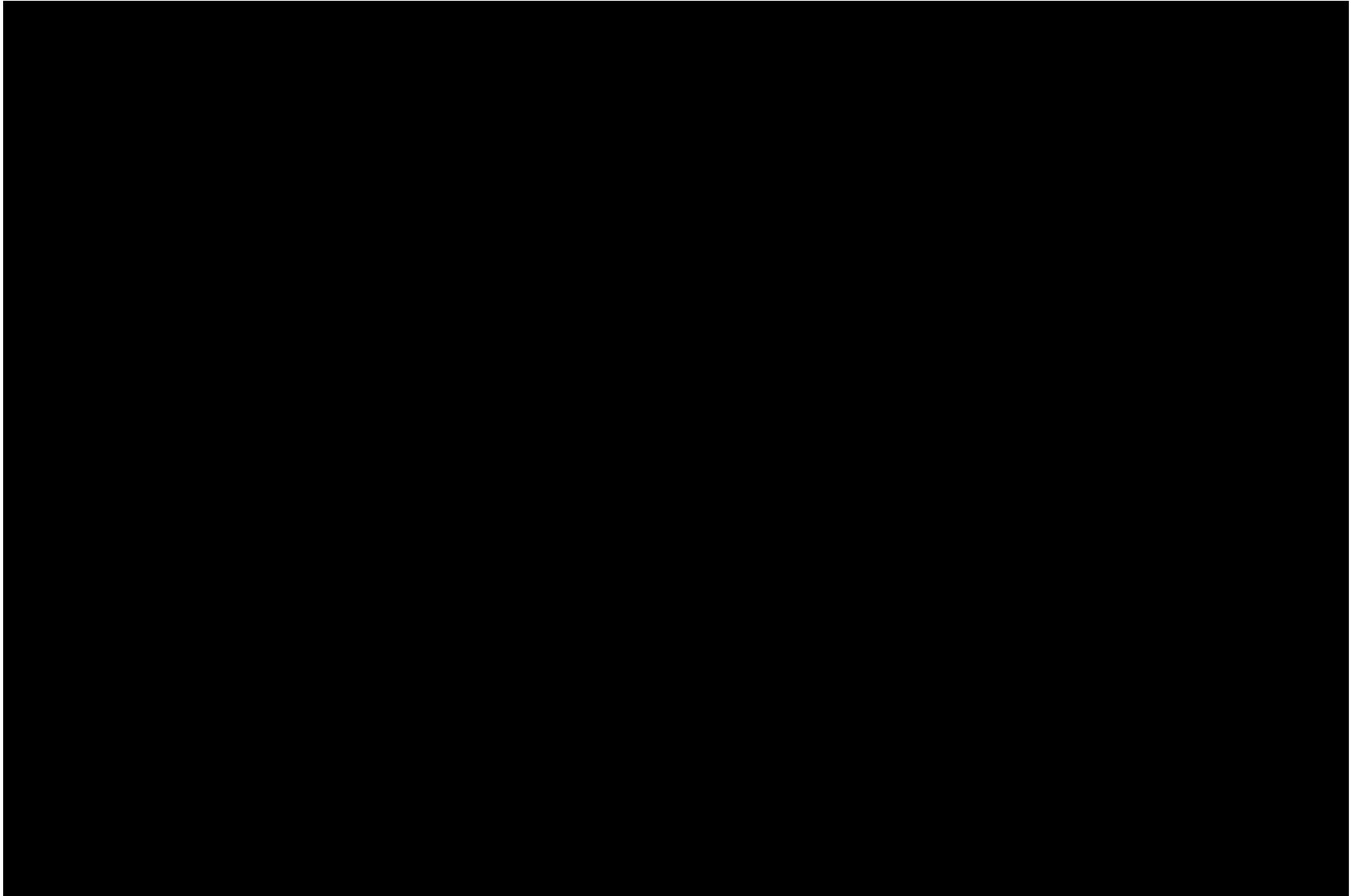


Fit of polynomial+signal  
peak shape

Stability vs mass window and 3<sup>rd</sup>, 4<sup>th</sup> order polynomial OK

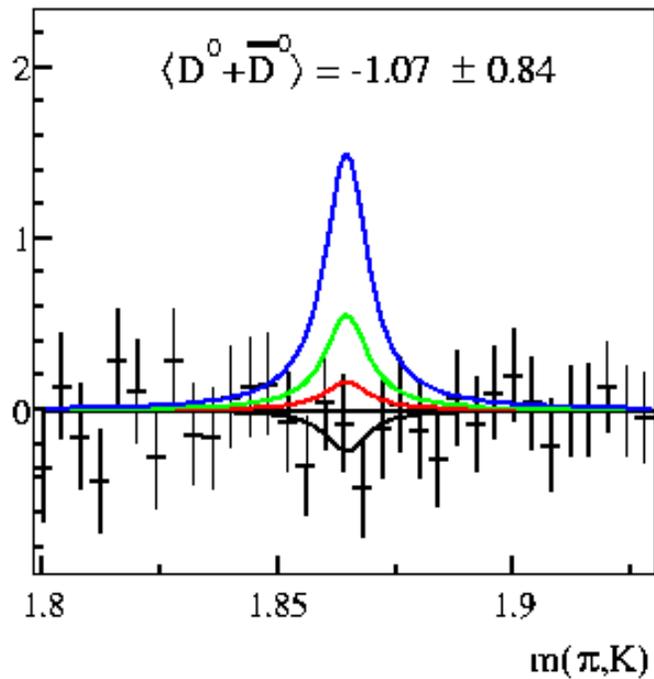
candidate plot for paper

After background subtraction



# Final result

QM02



Thesis

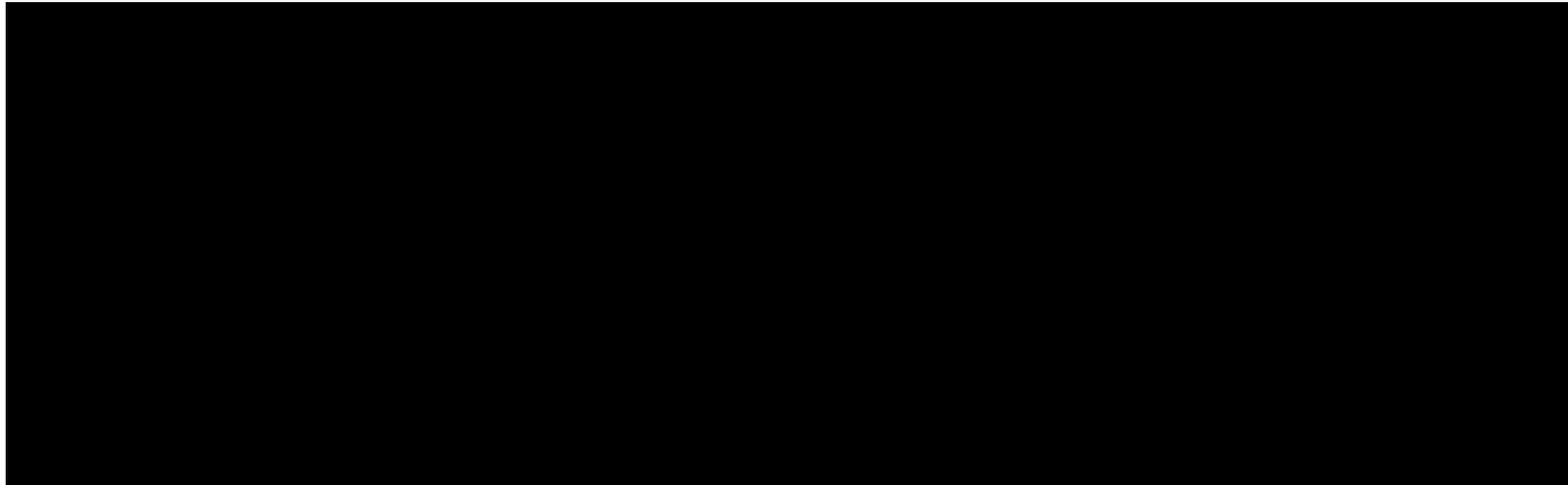


NB: different sets of models

Different mass resolutions used

Models ruled out: SMES, maybe ALCOR

# Some numbers



In paper: our values. What about models?

# Outline of paper

(roughly)

- Motivation
- Description of dataset (combined 10%, 20% set)
- Description of decay angle cut?
- Show acceptance/efficiency
- Mention mass resolution
- Show background subtracted spectra ( $D^0$  and anti- $D^0$  separately)
- Conclusion