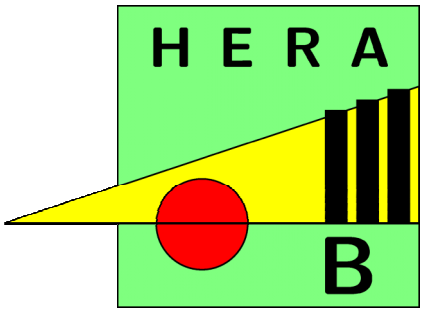


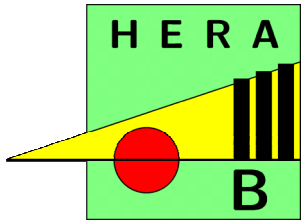
Physics highlights from Hera-B

57th PRC Open session, May 27th, 2004

- Data samples and triggers
- Results from MB data
- Results from dilepton trigger data
- Summary

M. Villa, INFN Bologna

Data and triggers



Data taking:

30. Oct 2002 - 3. Mar 2003

- 210 M minimum bias events

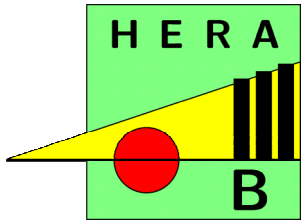
  Logging rates: 1 kHz (1.7 TB/d)

- 150 M dilepton triggered events with ~300k J/ψ

  J/ψ rates: 1200 - 1400 / hour

- 90 M hard photon + Glueball trigger

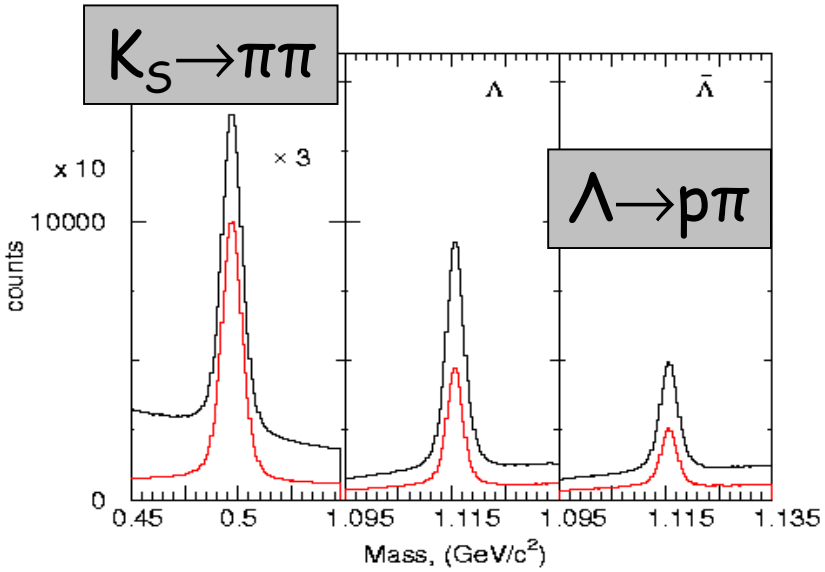
Minimum bias topics

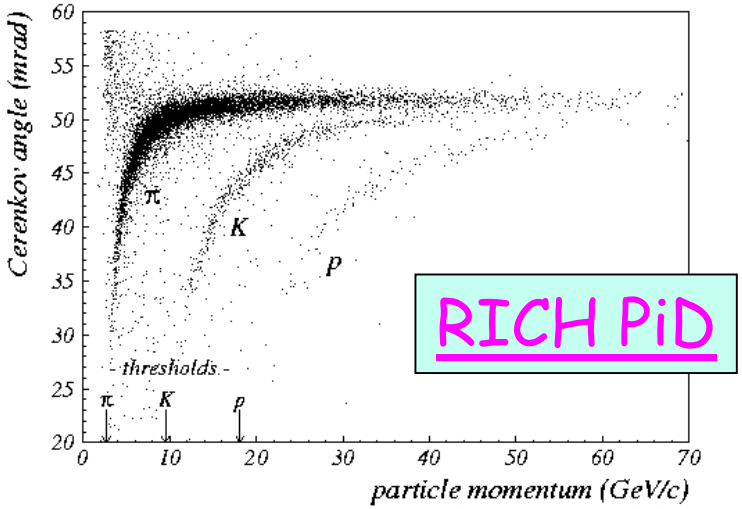


- Production of ϕ and K* mesons $\Rightarrow$
- V^o differential and total cross section
- Λ^o polarization
- Hyperon production
- Pentaquark searches (pK_S, $\Xi\pi$) $\Rightarrow$
- Bose-Einstein correlations
- D^+/D^o production ratio

See last PRC

Strangeness production



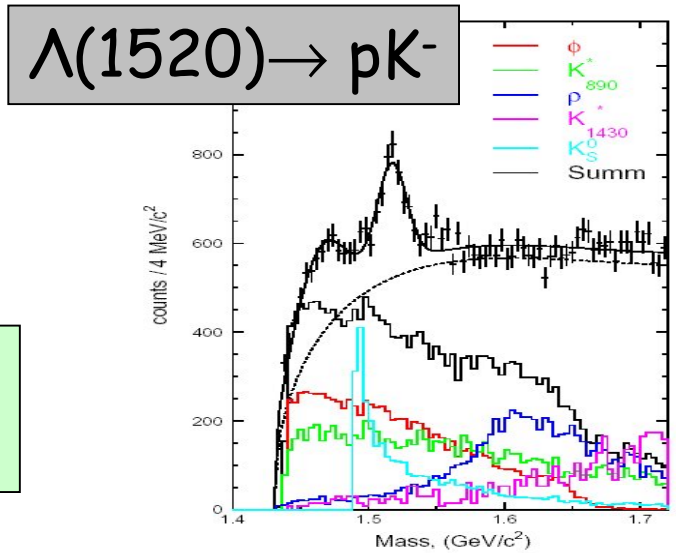


large statistics:

K_s ~ 3.4 x 10^6 K_s σ ~ 4,9 MeV

Λ ~ 1.4 x 10^6 σ ~ 1,8 MeV

Λ(1520) ~ 3000 σ ~ 8 MeV



Good kaon ID: 10< p <60 GeV

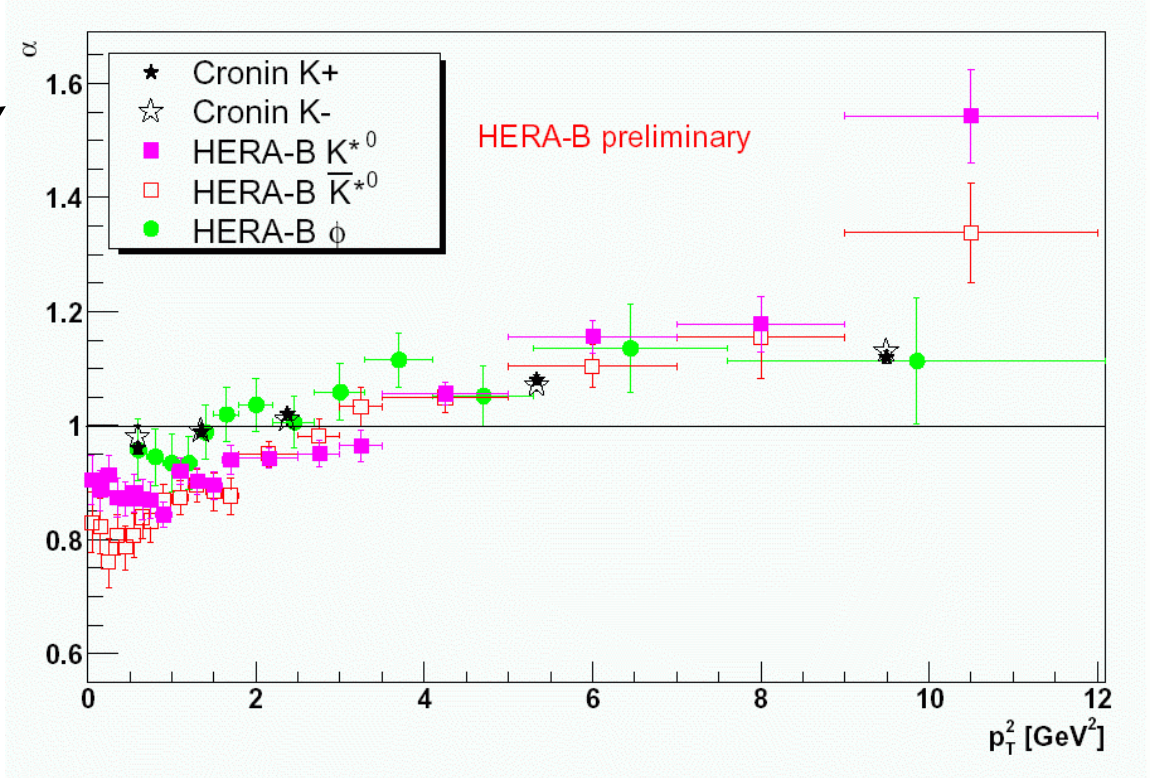
Good proton ID: 20< p <60 GeV

Production of ϕ and K*

Differential cross sections $d\sigma/dp_t^2$
measured for three nuclei
(^{12}C, ^{48}Ti, ^{184}W) up to 12 GeV^2/c^2 in p_t^2

Cronin effect observed for resonances

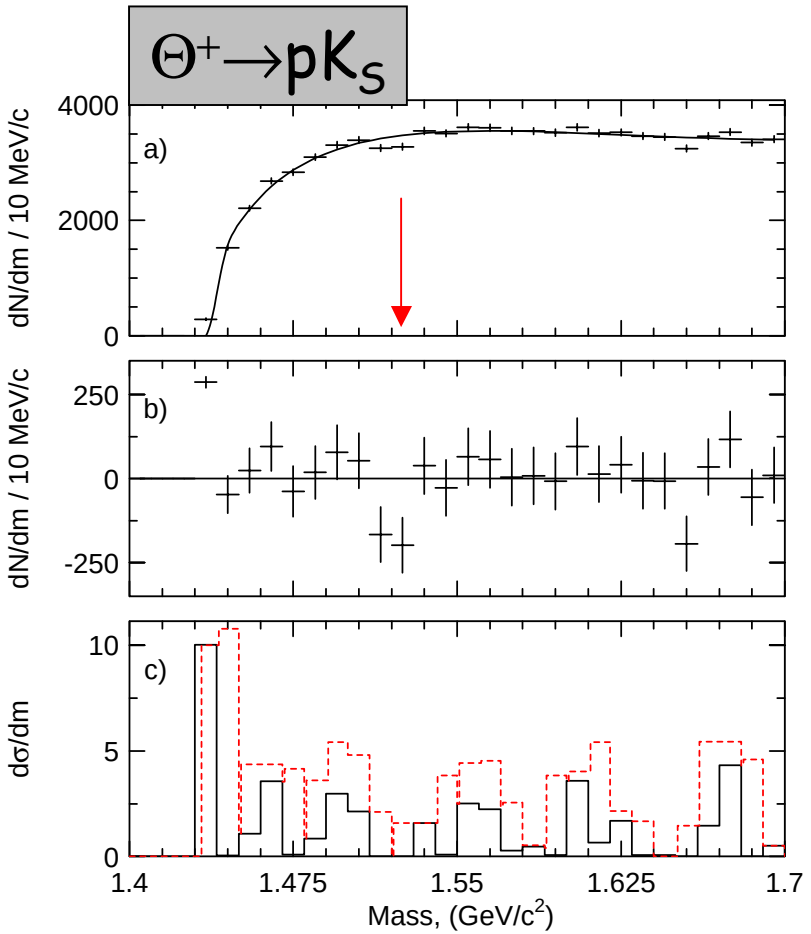
$$\frac{d\sigma_{pA}}{dp_T^2} = \frac{d\sigma_{pp}}{dp_T^2} A^{\alpha}$$



$\phi \rightarrow K^+K^-$:
52600 events

$K^{*o} \rightarrow K^{\pm}\pi^{\mp}$ + cc:
952000 events

Pentaquark searches ($\Theta^+ \to pK_S$)



No evidence of resonances in the mass region around 1530 GeV.

The upper limit on the particle yield ratio relative to Λ_{1520} is:

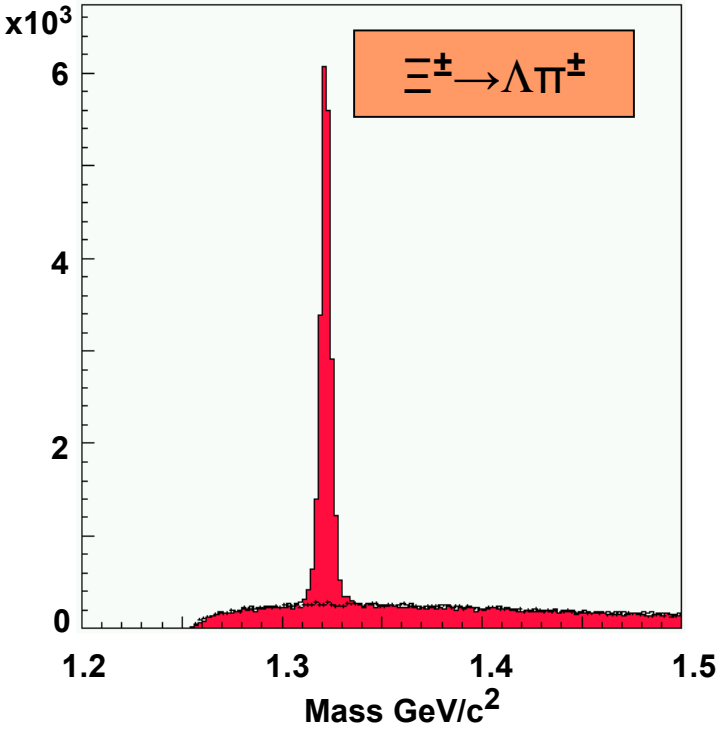
$\Theta^+/\Lambda_{1520} < 0.02$ (95% C.L.)

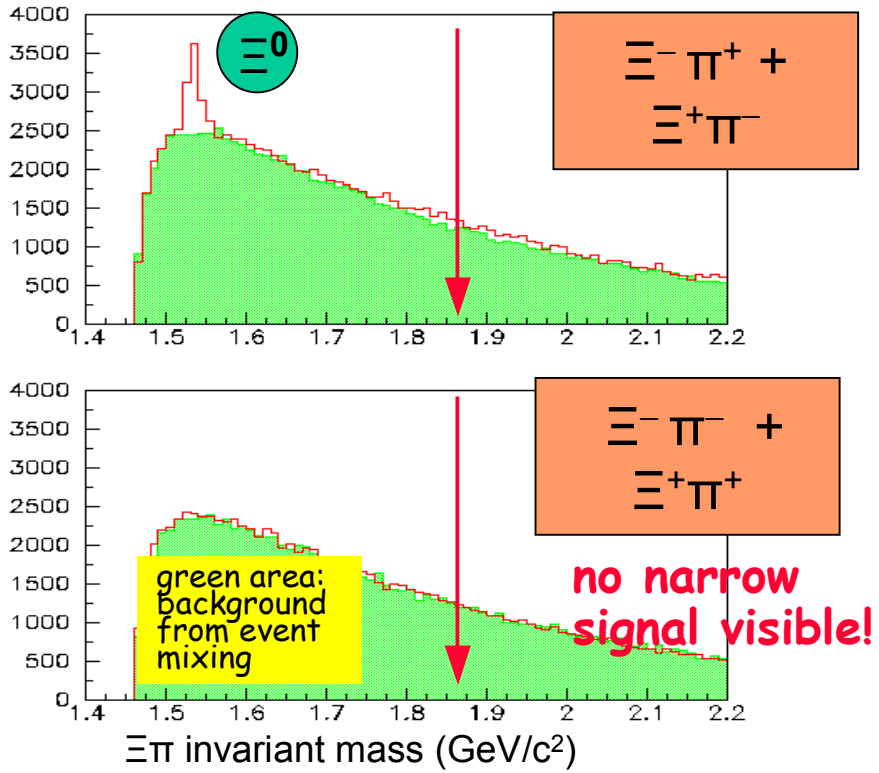
Hermes: $\Theta^+/\Lambda_{1520} \approx 1.6 \div 3.5$

(same BR for Θ^+ decays assumed)

Evaluation of the nuclear cross section upper limit in progress

Pentaquarks in Ξπ?





Statistics:

~11.300 Ξ^-, σ ~ 2,6 MeV

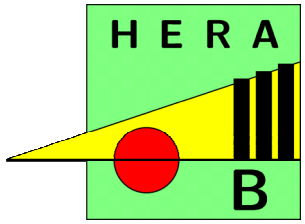
~ 7.700 Ξ^+,σ ~ 2,6 MeV

Upper limits (95% cl):

$\Xi^{--}(1862) / \Xi^0(1530) < 0.077$

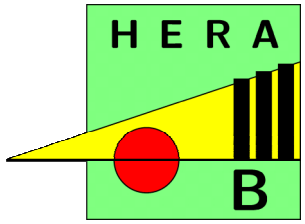
$\Xi^{++}(1862) / \Xi^0(1530) < 0.058$

Dilepton trigger topics

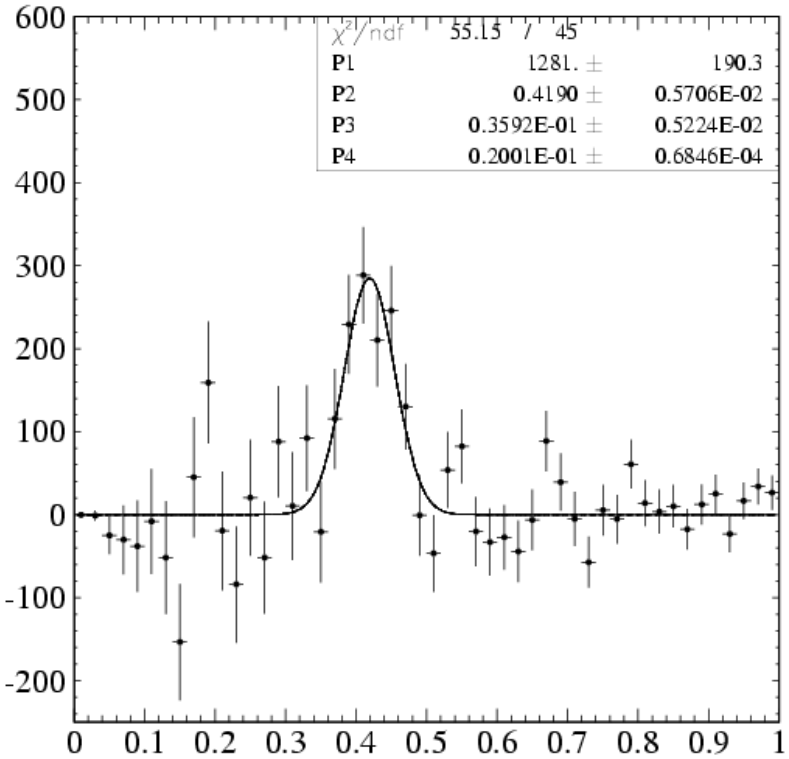


- Production ratio of J/ψ and ψ' See last PRC
- J/ψ and ψ' differential distributions
- Charmonium production A dependence
- χ_c production, A dependence ⇒
- $b\bar{b}$ production cross section ⇒
- Υ production cross section See last PRC
- Upper limit on BR($D^o \rightarrow \mu^+\mu^-$) ⇒

χ_c production



$\chi_c \rightarrow J/\psi\ \gamma \rightarrow \mu^+\mu^-\ \gamma$



$$R_{\chi_c} = \frac{N(\chi_c)}{N(J/\psi)} \cdot \frac{\varepsilon_{J/\psi}}{\varepsilon_{J/\psi(\chi)} \cdot \varepsilon_\gamma}$$

$\varepsilon_\gamma \approx 0.4$

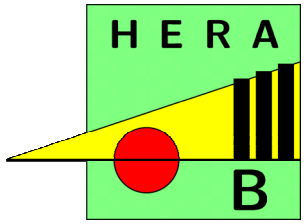
Systematic studies ongoing

In 15% of μμ sample ≈1300 χc
➡ ≈10 k in full sample exp.

$R(\chi_c) = 0.21 \pm 0.05$

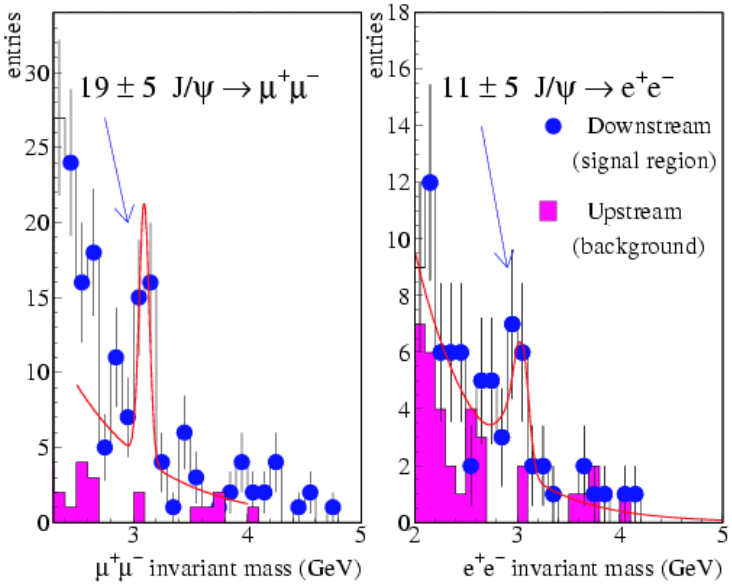
2000
$N(\chi_c) = 380 \pm 74$ (both $\mu^+\mu^-$, e^+e^-)
$R(\chi_c) = 0.32 \pm 0.06 \pm 0.04$ √

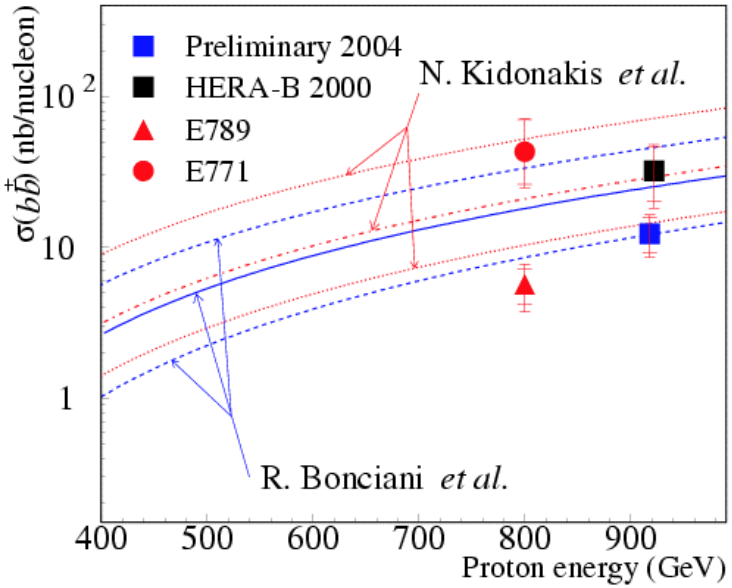
$b\bar{b}$ production



Analysis of 2002/03 data:

- 35% of e^+e^- and $\mu^+\mu^-$ statistics
- Expect $N_B \sim 100$ for full sample
- J/ψ acceptance: $-0.35<x_F<0.15$
  (90% of $b\bar{b}$ cross section)



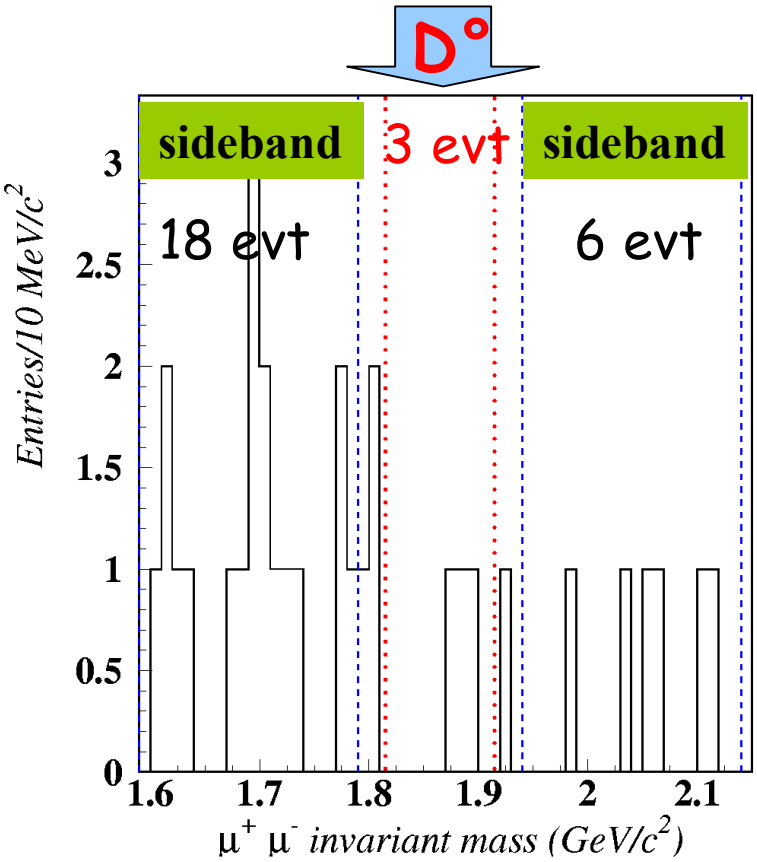


- Preliminary results of both channels are compatible
- 1.5 σ lower than 2000 measurement

preliminary

$$\sigma(b\bar{b}) = 12.3^{+3.5}_{-3.2}\ \text{nb/N}$$

Limit on BR($D^o \to \mu^+\mu^-$)



BR($D^o \to \mu^+\mu^-$) < 2.0 x 10^{-6} (90% cl)

DESY-04-086

hep-ex/0405059

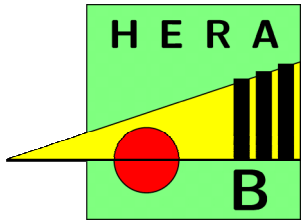
Submitted to Phys Lett B

CDF: BR($D^o \to \mu^+\mu^-$) < 2.5 x10^{-6}

Phys.Rev. D 68 (2003) 091101

Currently best upper limit

Summary



- High quality of data collected
- A large variety of physics topics addressed
  (*s*, *c*, *b* and exotics)
- Preliminary results on most topics presented
- Publications on the most advanced analyses in preparation ($D^0 \rightarrow \mu^+\mu^-$, Θ^+, *bb*, Υ, D^+/D^0, χ_c ,...)
- Several other topics could lead to publication, manpower permitting