A Study of Open Charm Production in p+p Collisions at STAR

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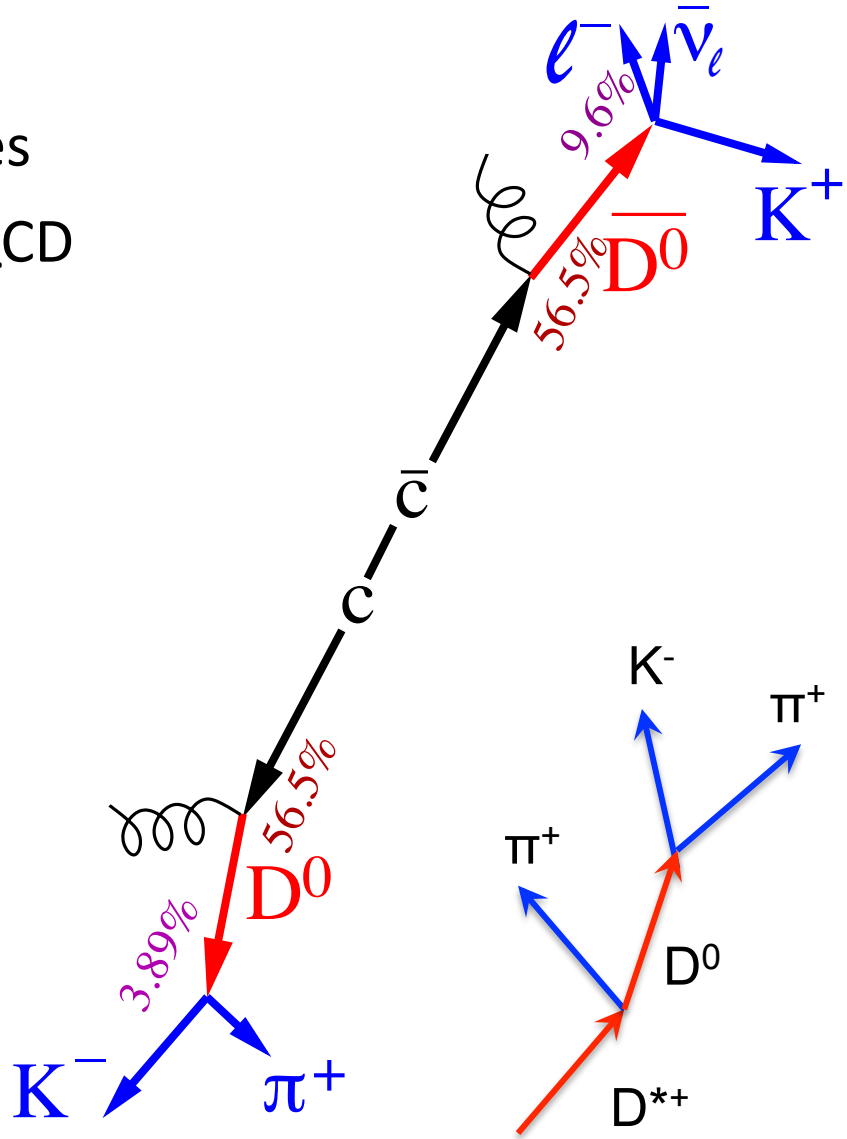
Nuclear Physics Institute AS CR

Czech Technical University Prague

Introduction

- ★ Heavy Quarks c, b
  - ★ produced in initial hard processes
  - ★ production well described by pQCD
  - ★ excellent probe of the strongly interacting Quark-Gluon Plasma



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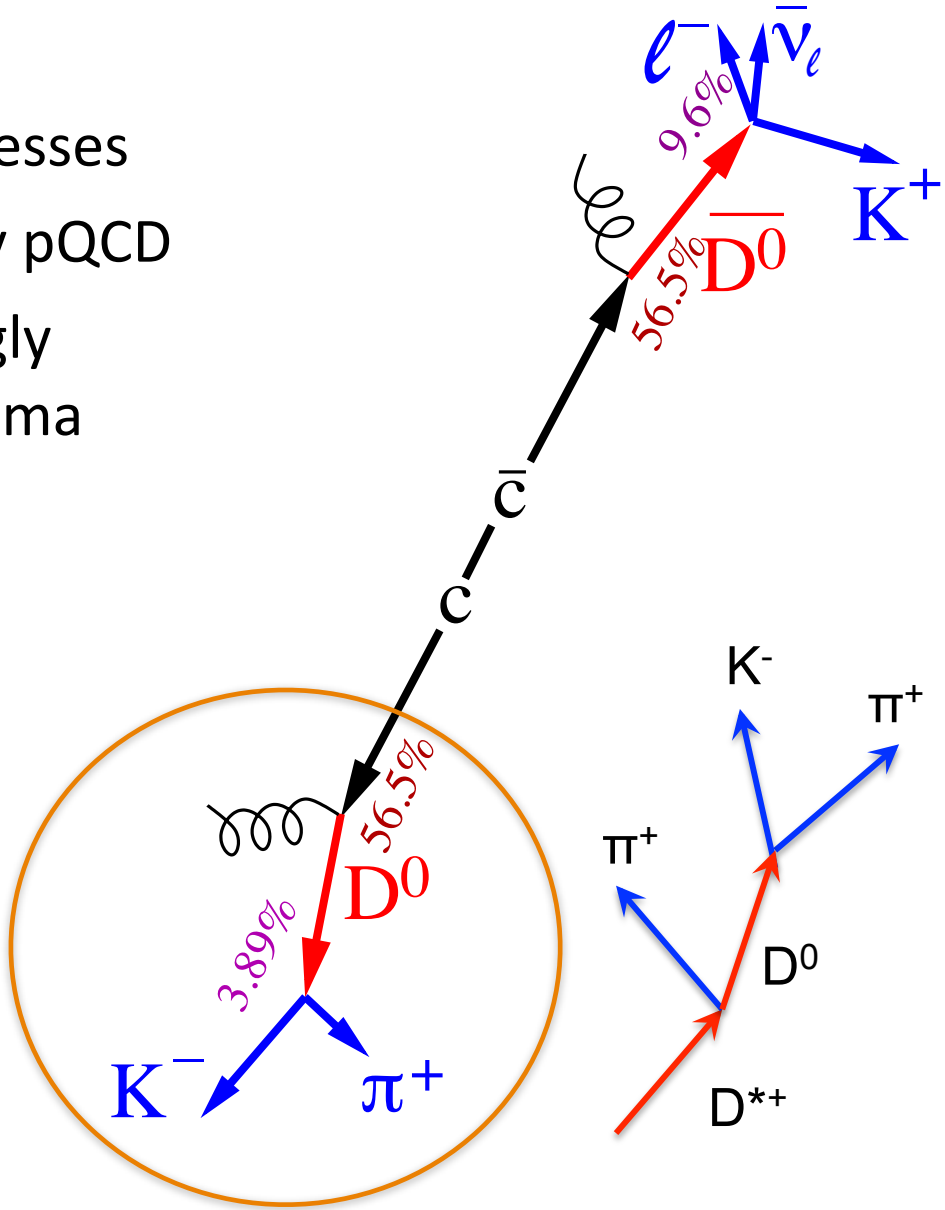
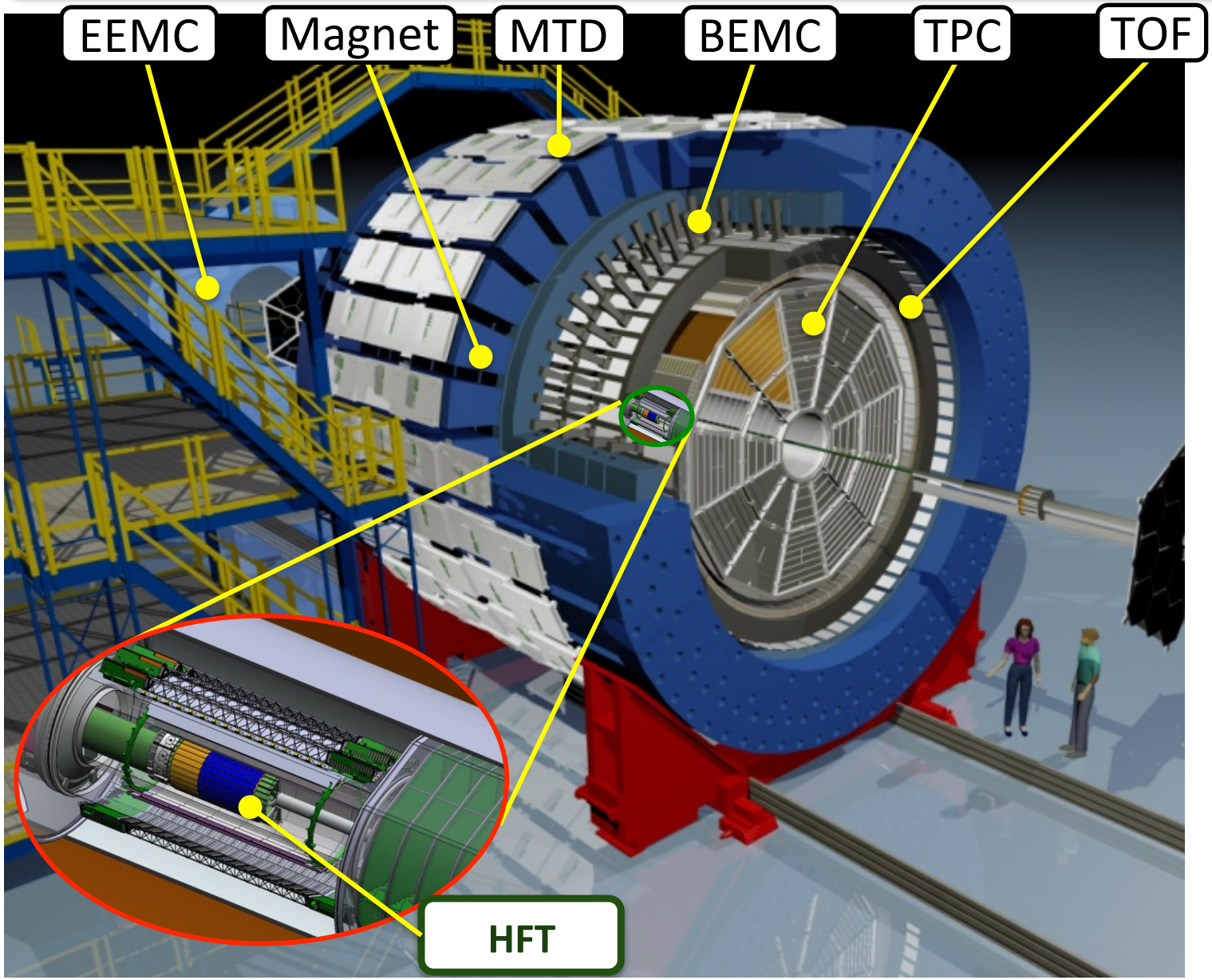


- ★ Direct reconstruction of open charm mesons

The STAR Detector



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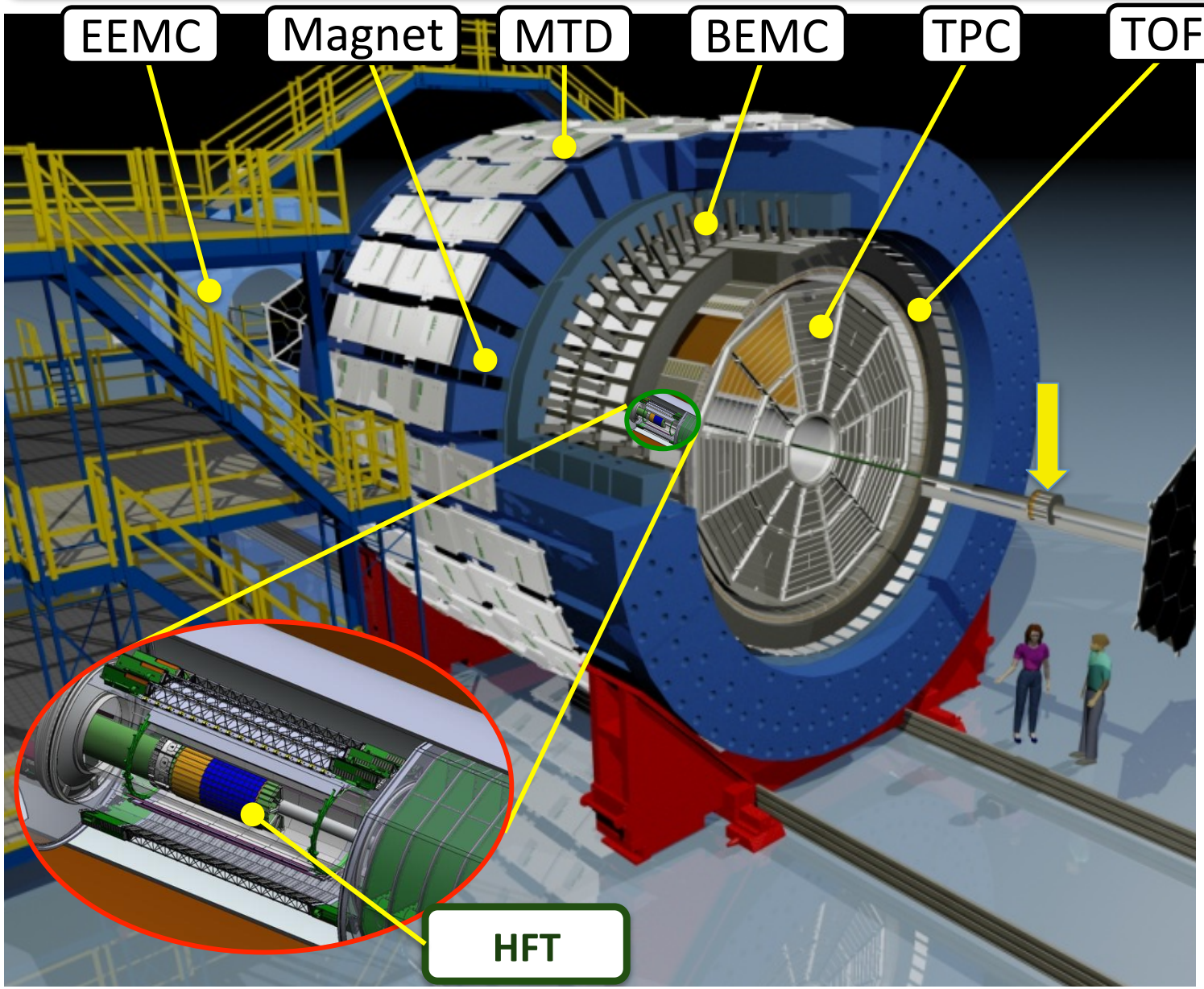

★ **VPD: minimum bias trigger**

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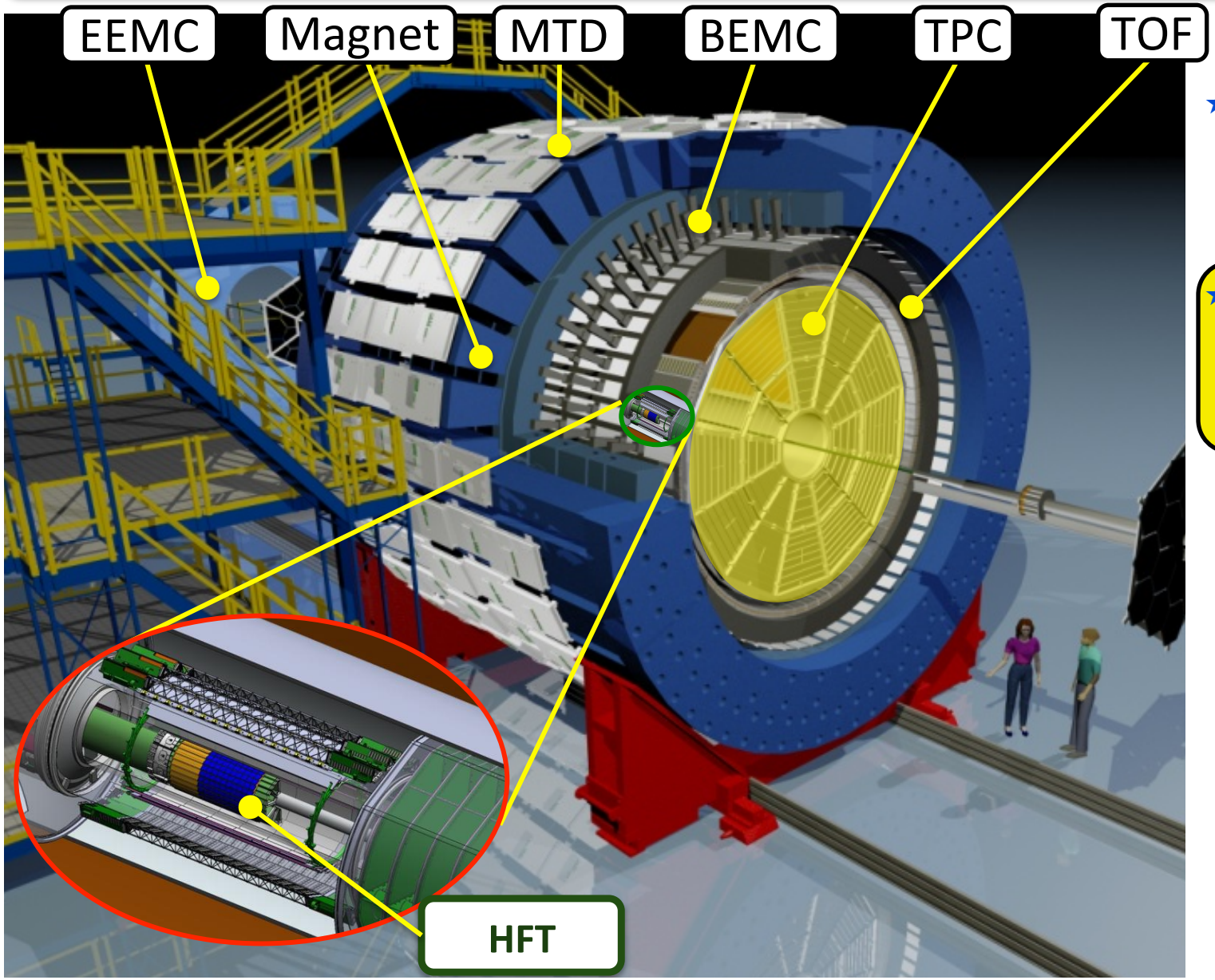

- ★ **VPD: minimum bias trigger**
- ★ **TPC: particle identification, momentum**

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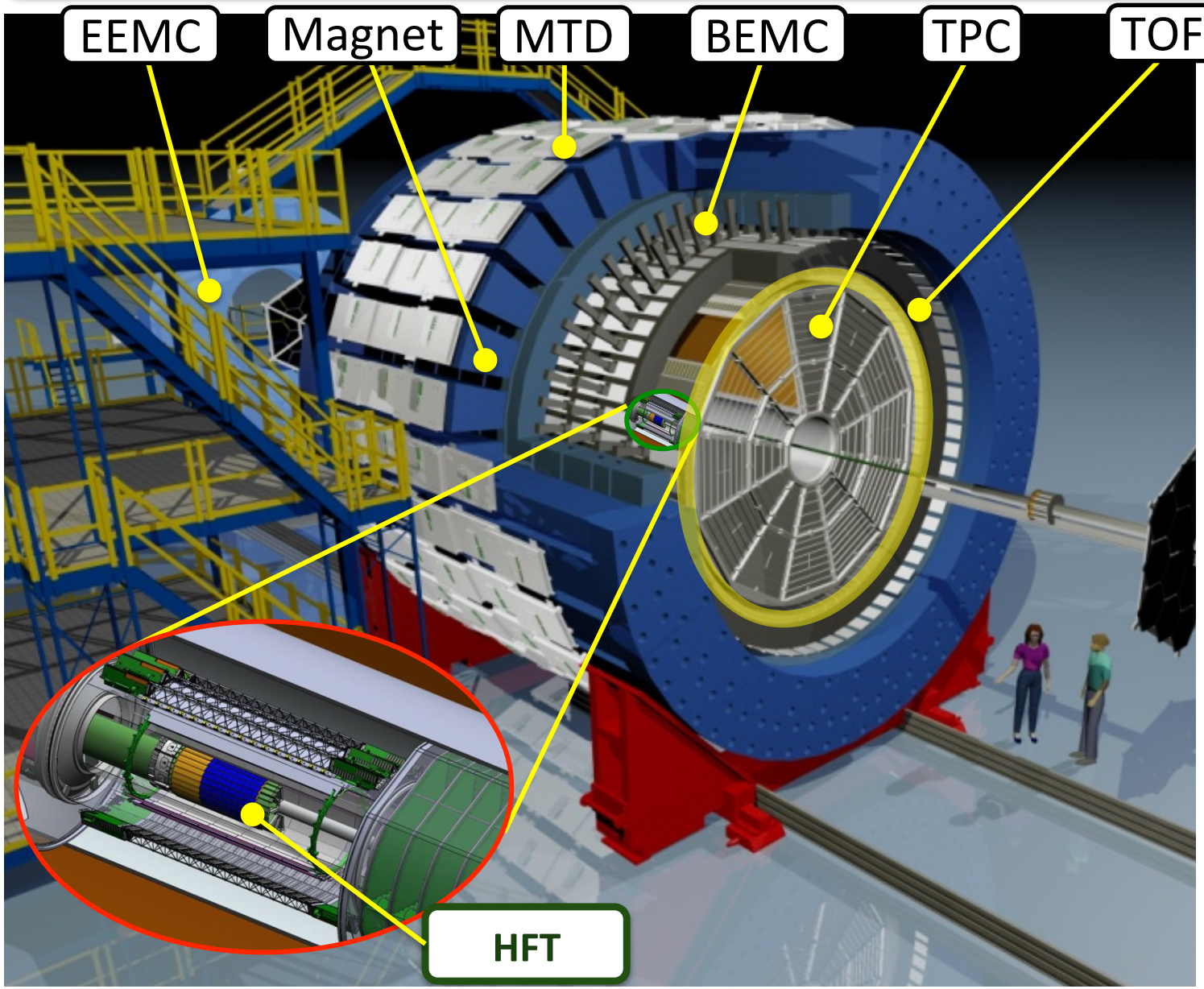

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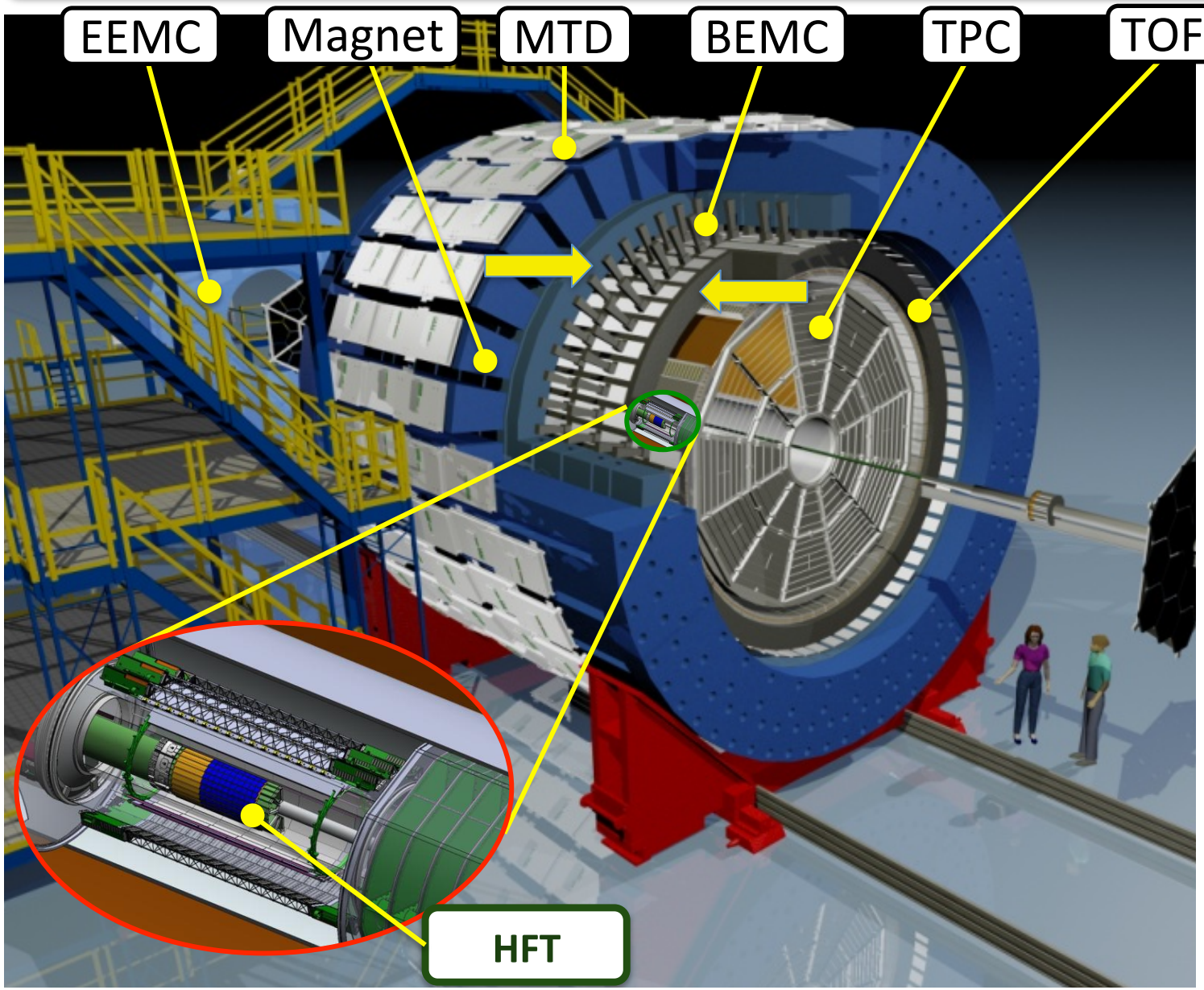
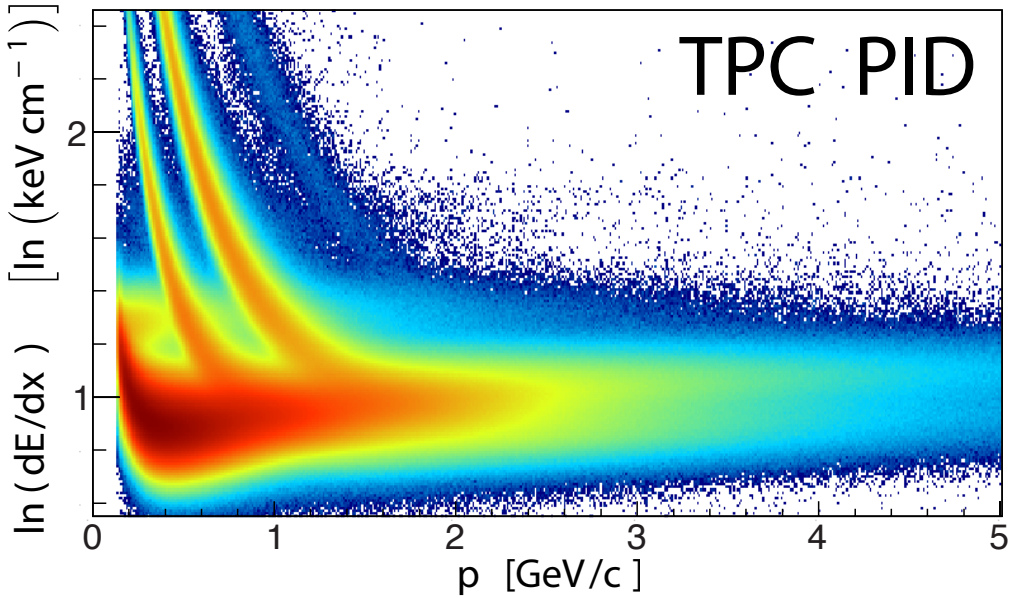
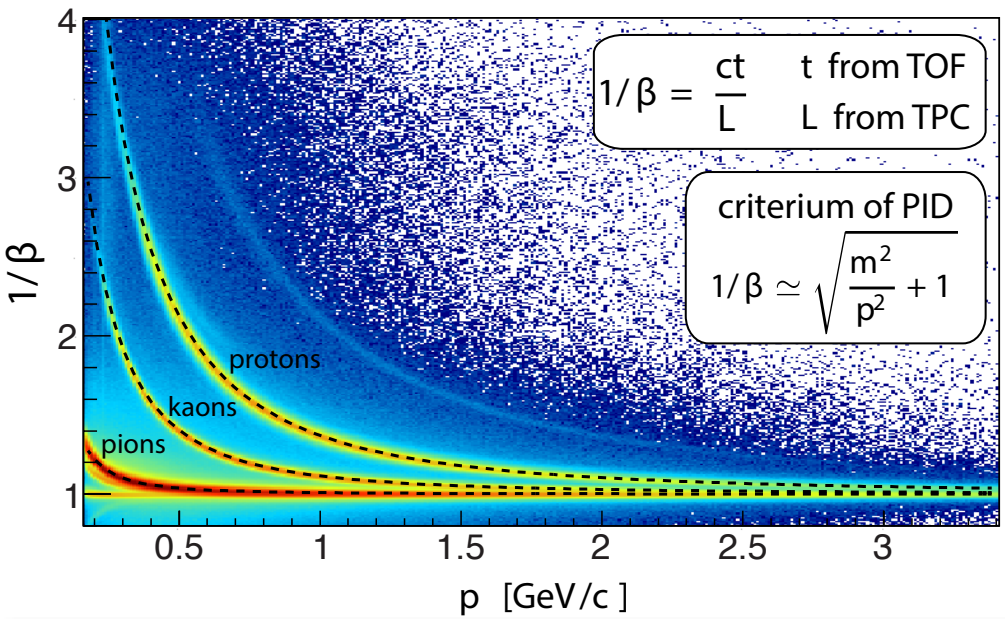


- ★ **VPD: minimum bias trigger**
- ★ **TPC: particle identification, momentum**
- ★ **TOF: particle identification** (time resolution 110 ps in p+p, 87 ps in Au+Au)
- ★ **BEMC: high-energy trigger, electron identification**

Daughter Particle Identification





TOF provides clean sample of kaons with momentum up to ~1.6 GeV/c

kaon - pion separation better by TPC than by TOF for track with momentum above ~2.5 GeV/c

Energy	200 GeV	500 GeV	500 GeV
Trigger	VPDMB	VPDMB	BHT1
# events	105M	51M	111M
σ^{pp}	30 ± 3.5 mb	34 ± 4 mb	6 ± 1 μb

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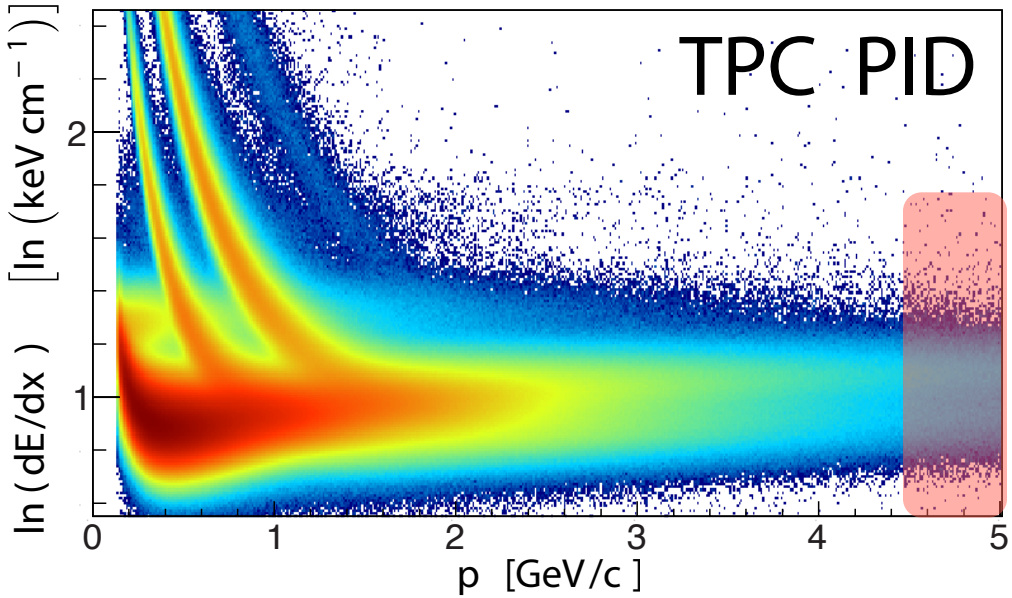

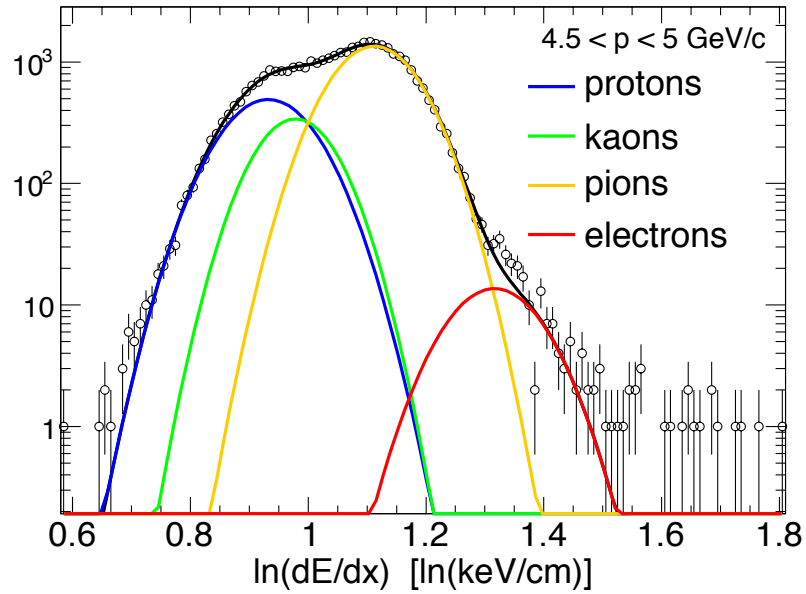

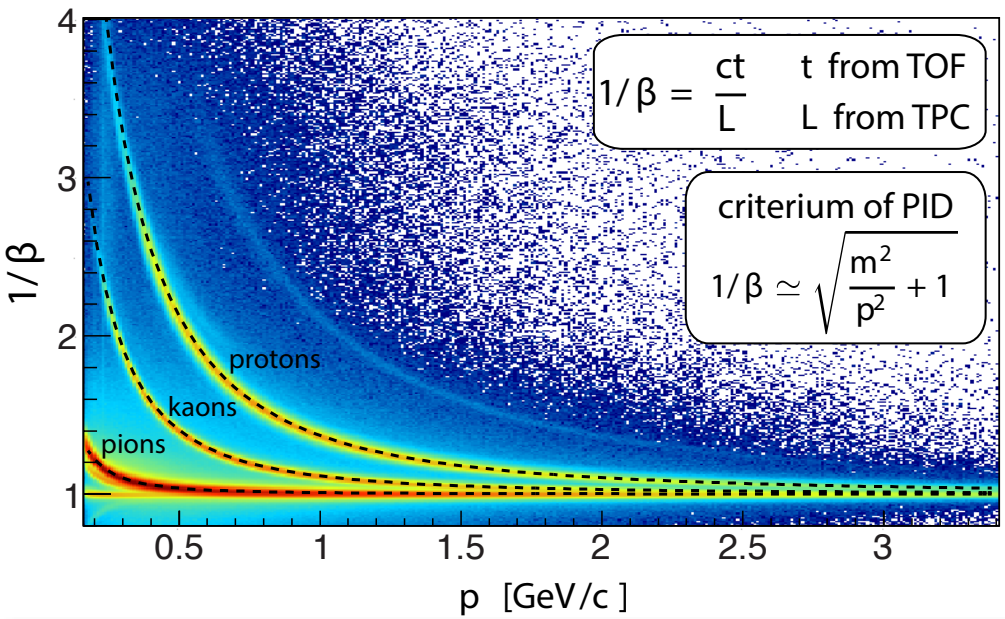

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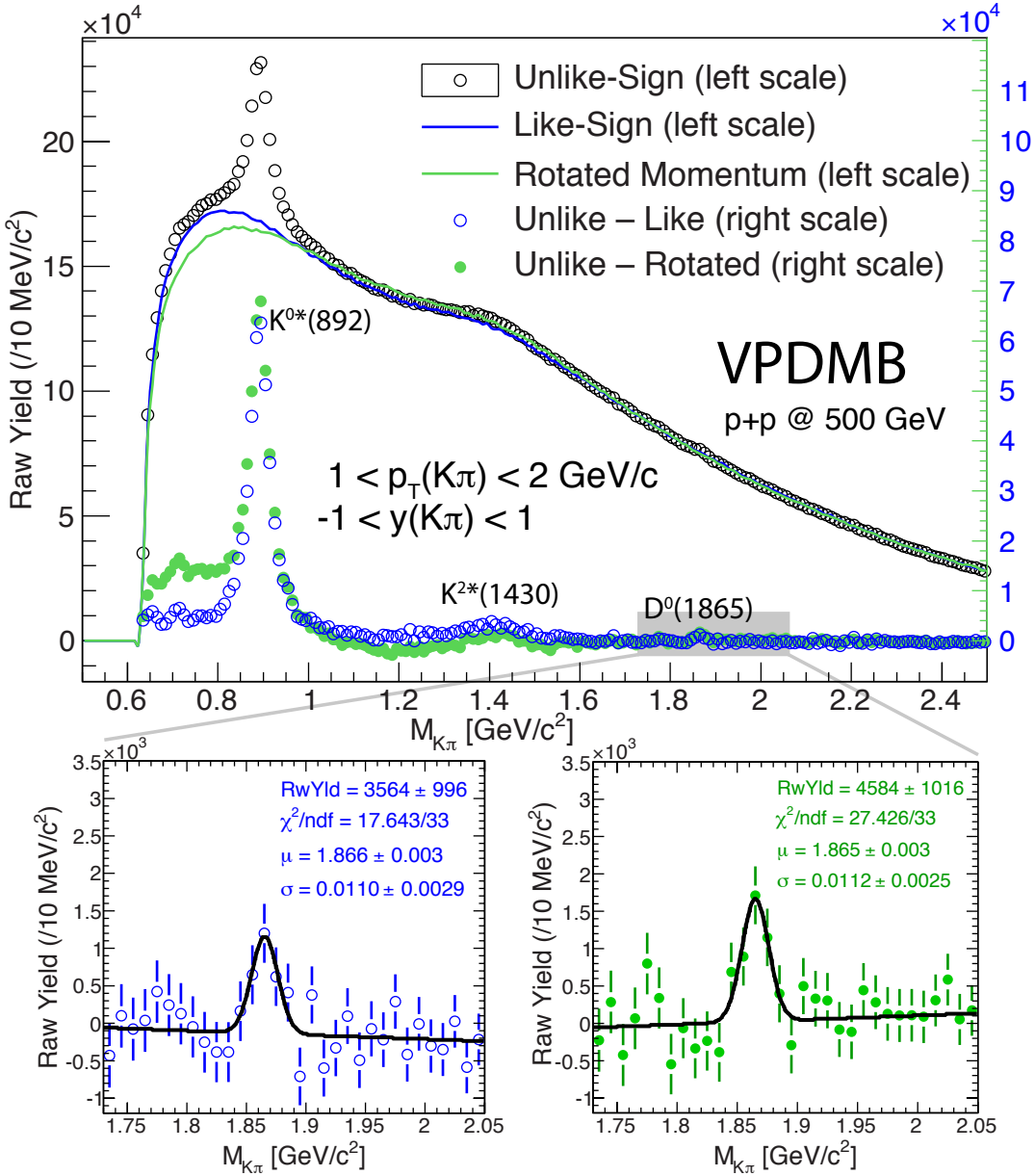

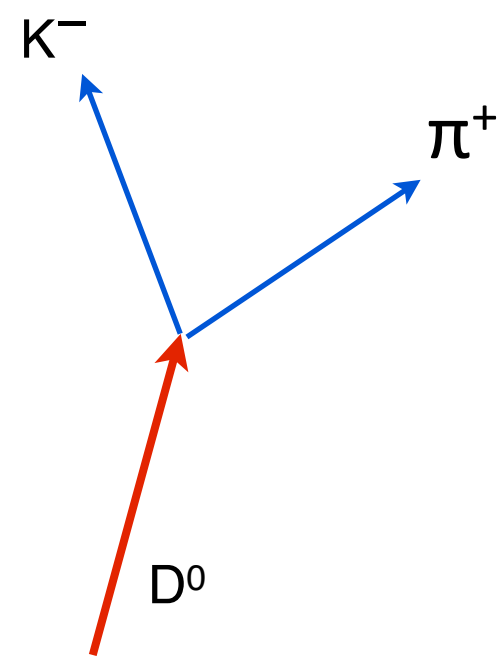

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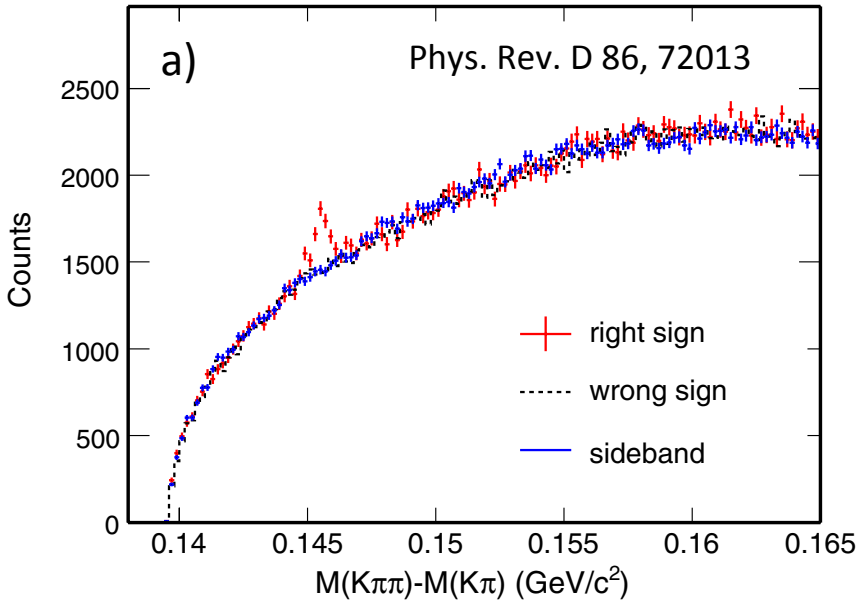

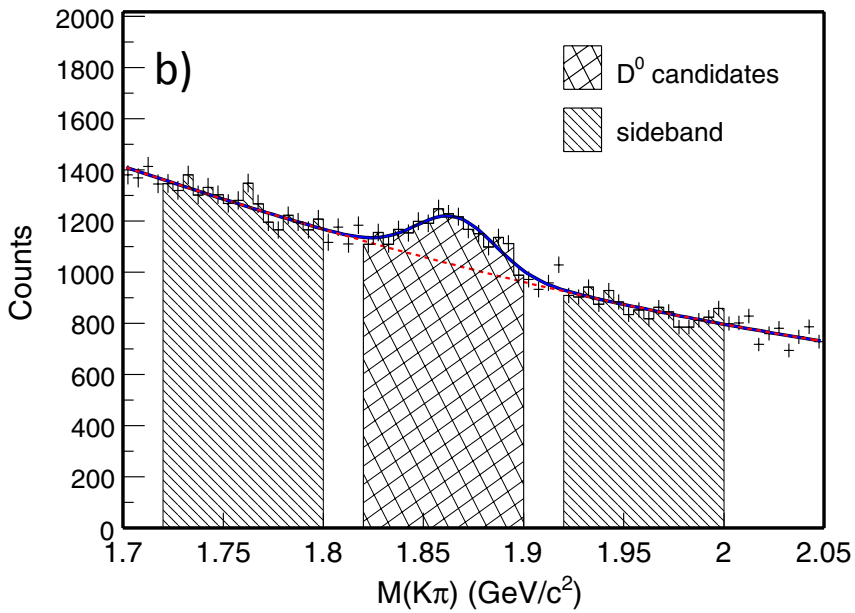

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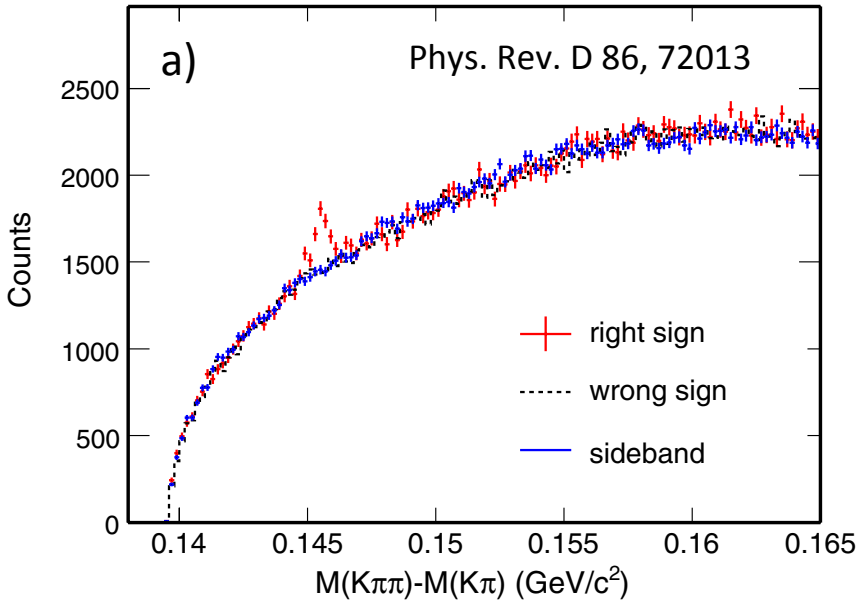

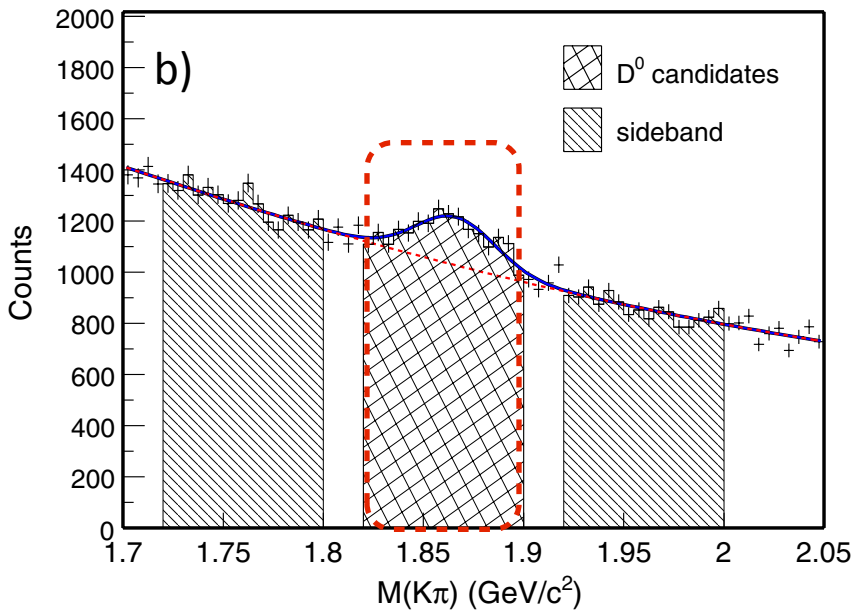

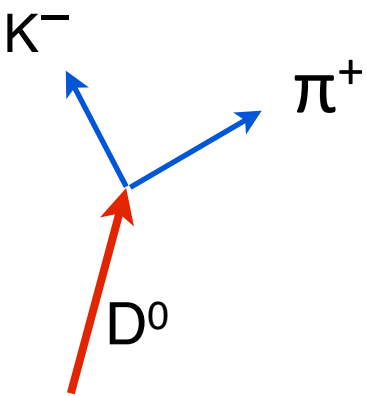

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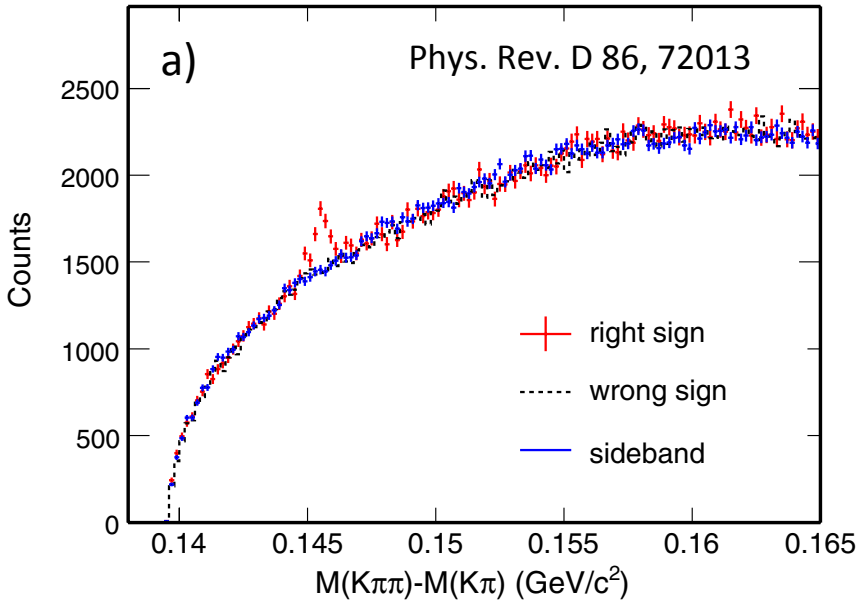

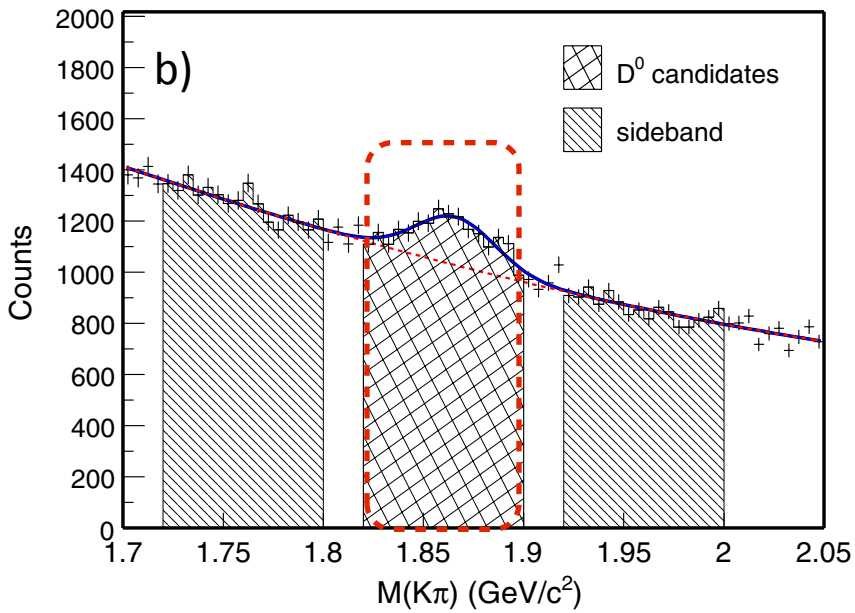

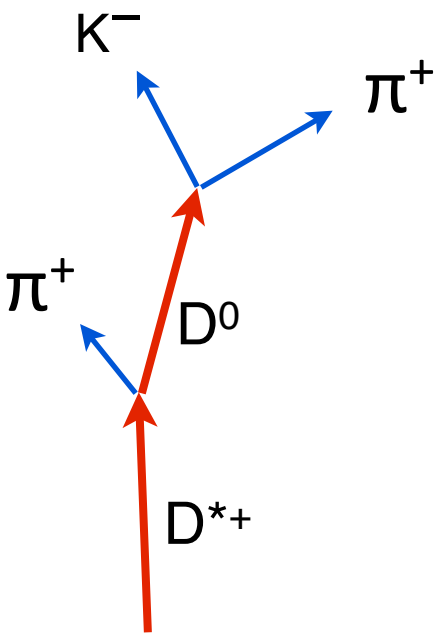

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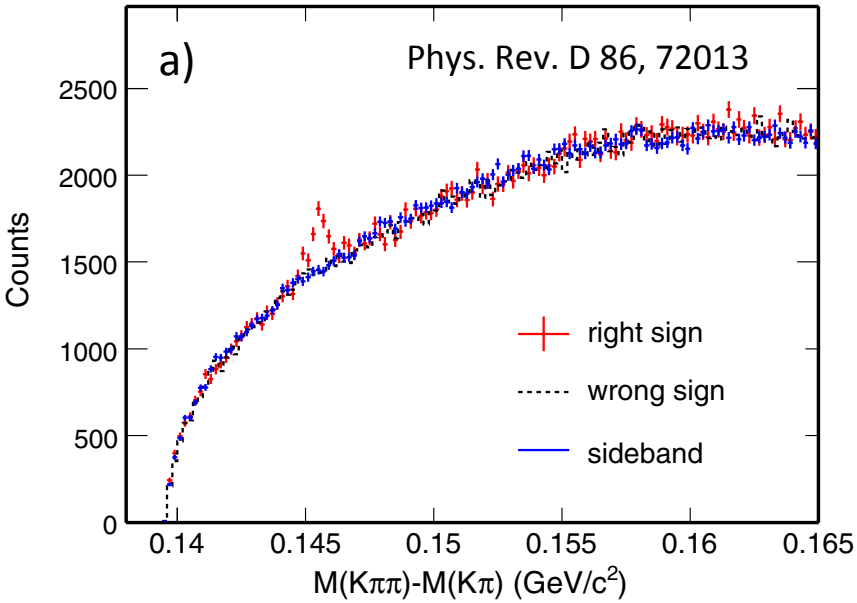

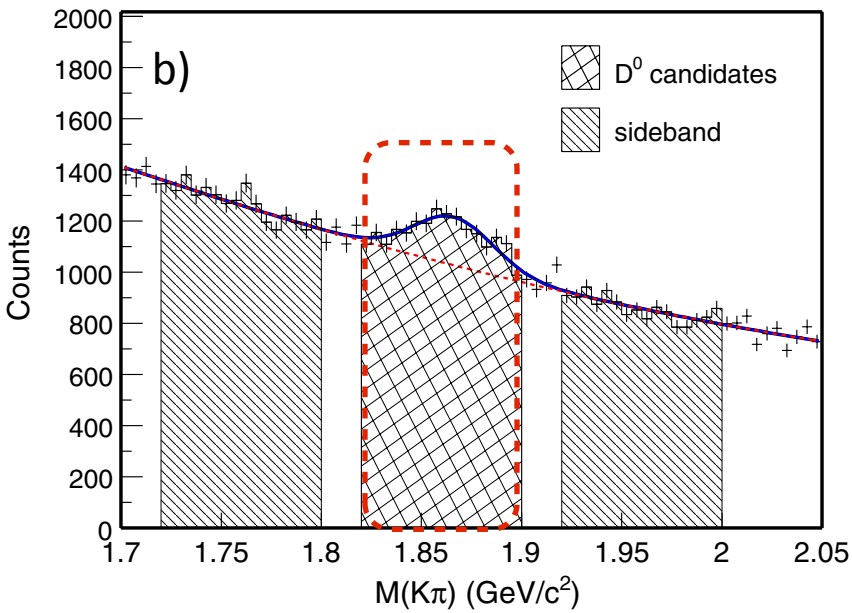

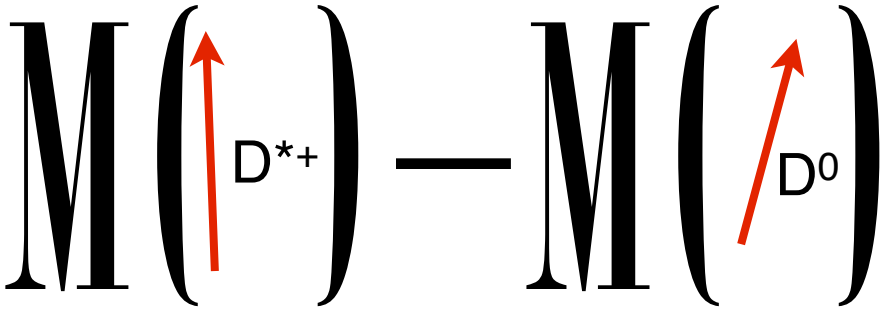

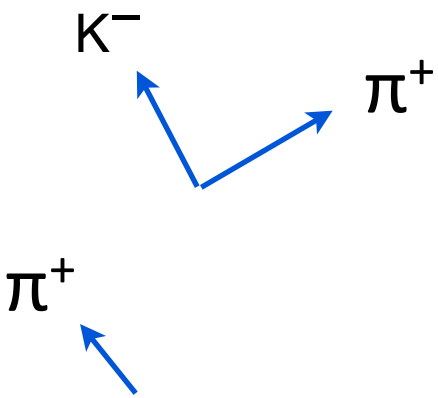

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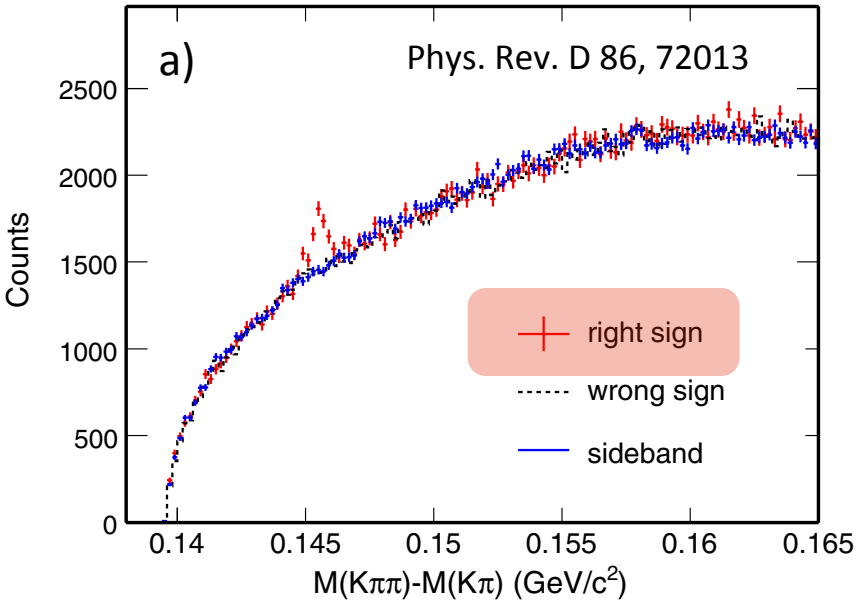

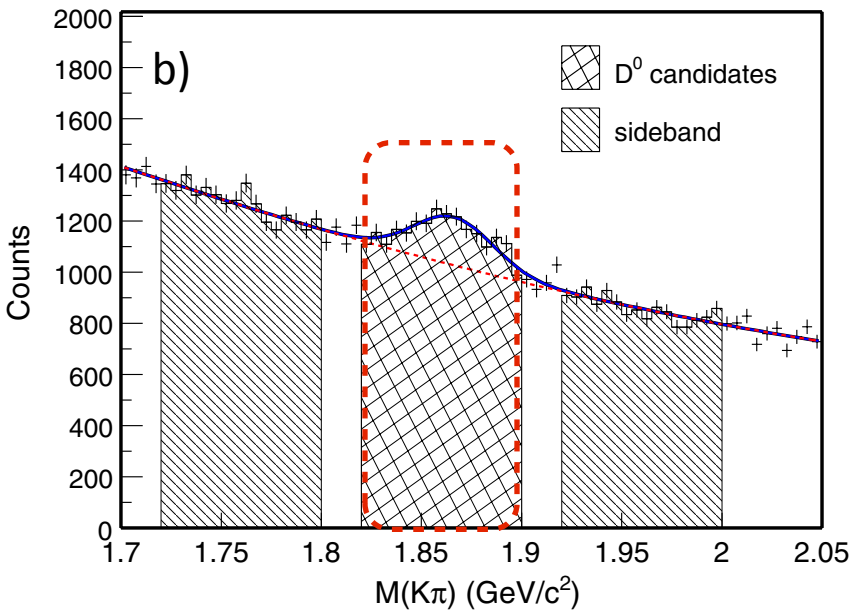

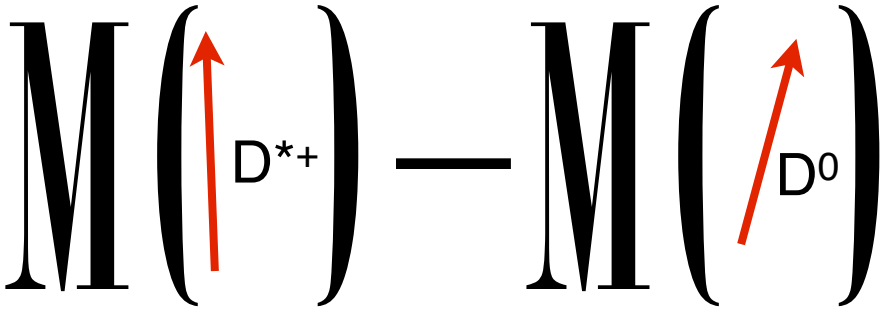

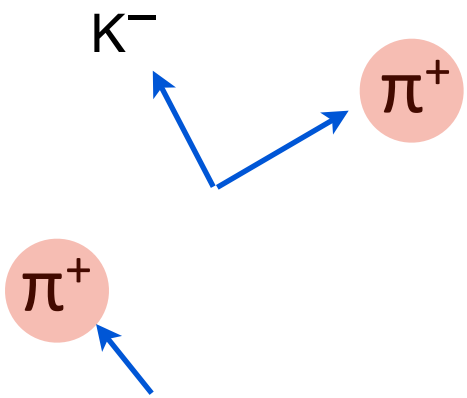

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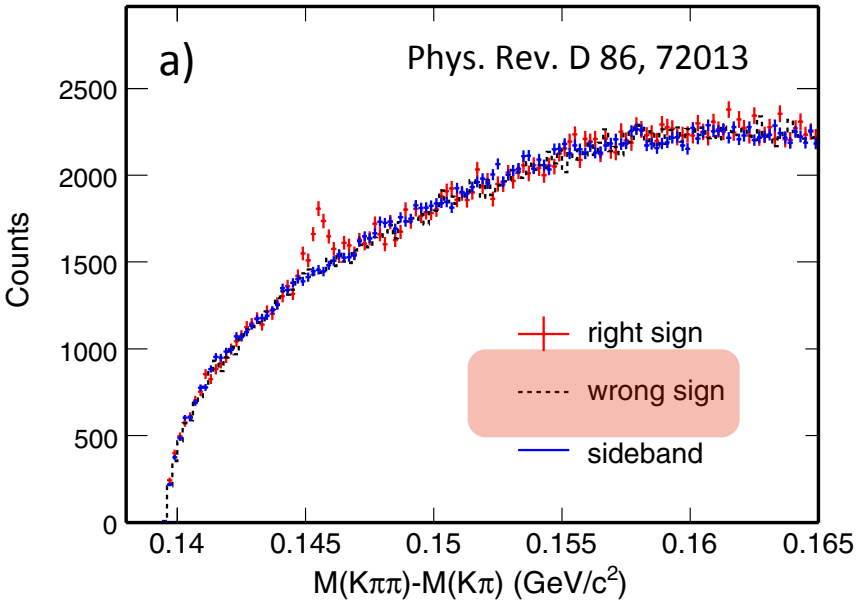

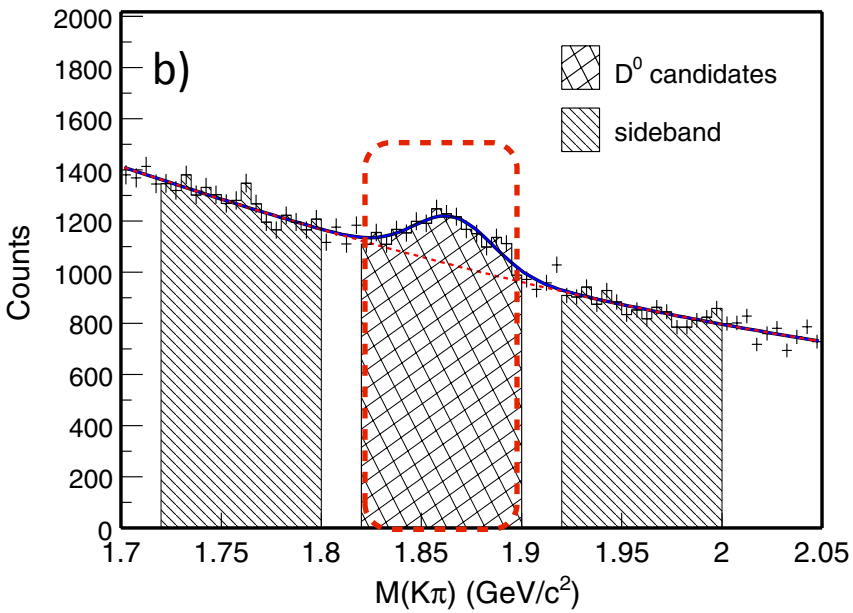

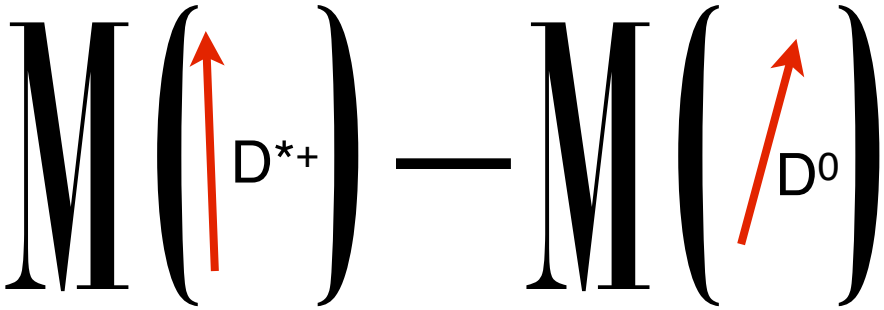

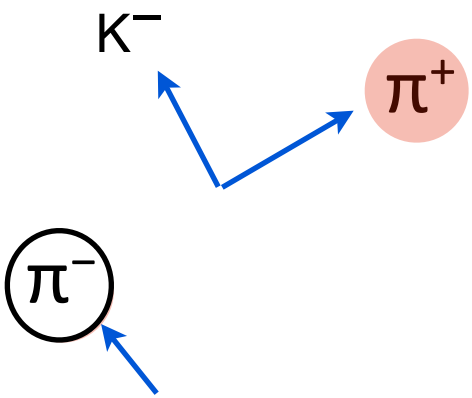

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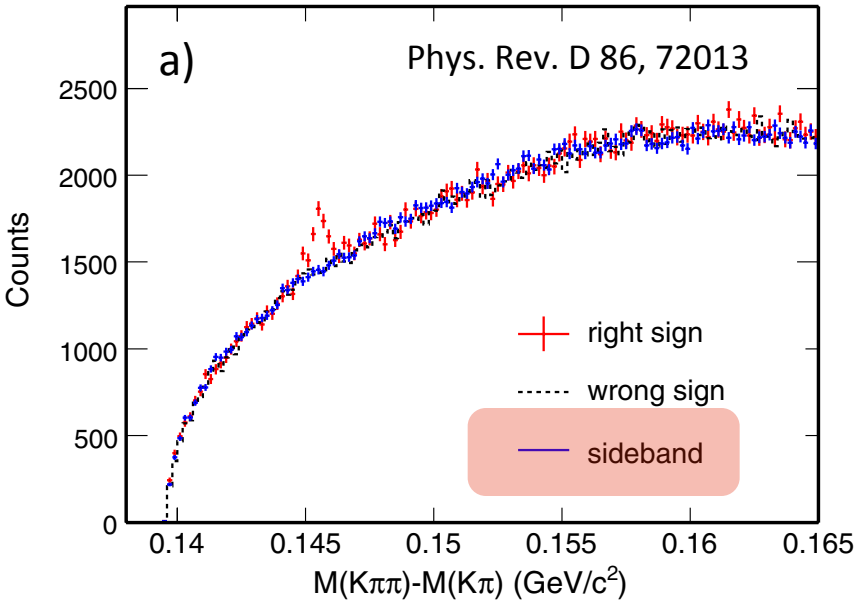

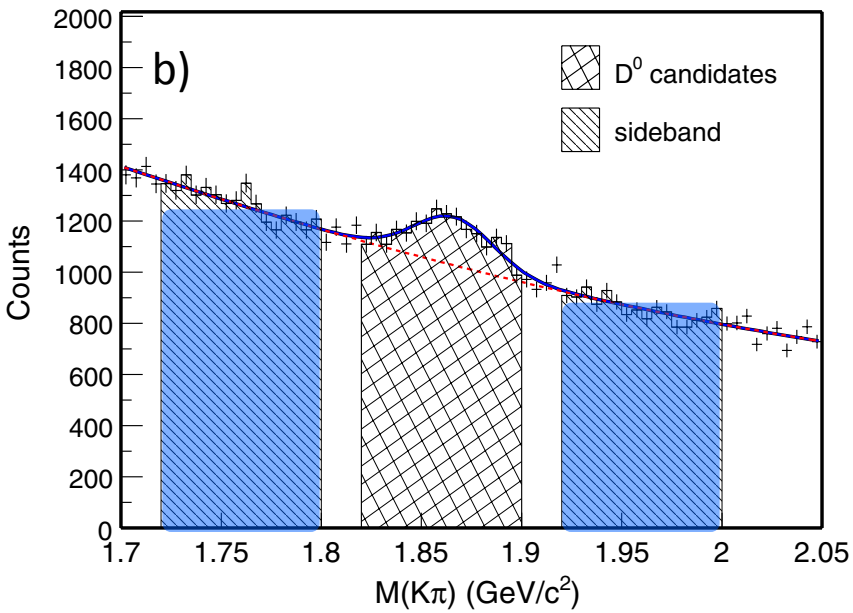

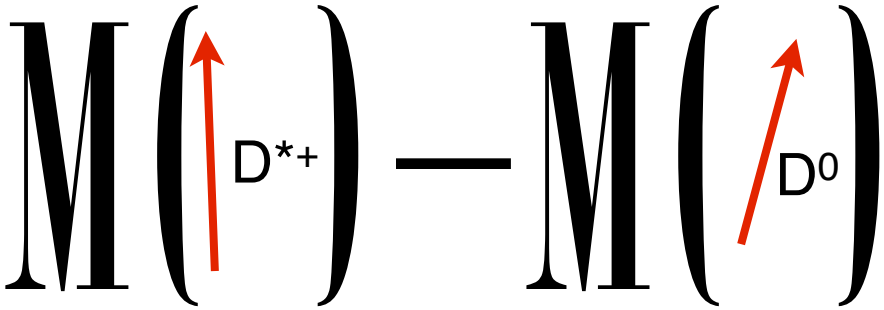

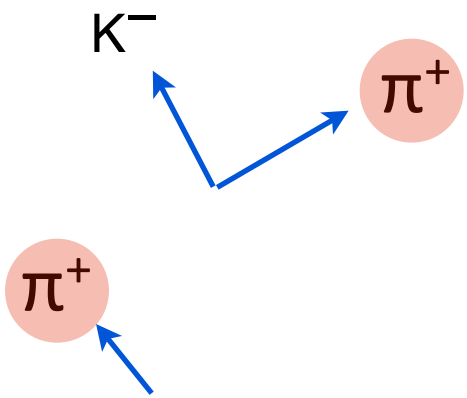

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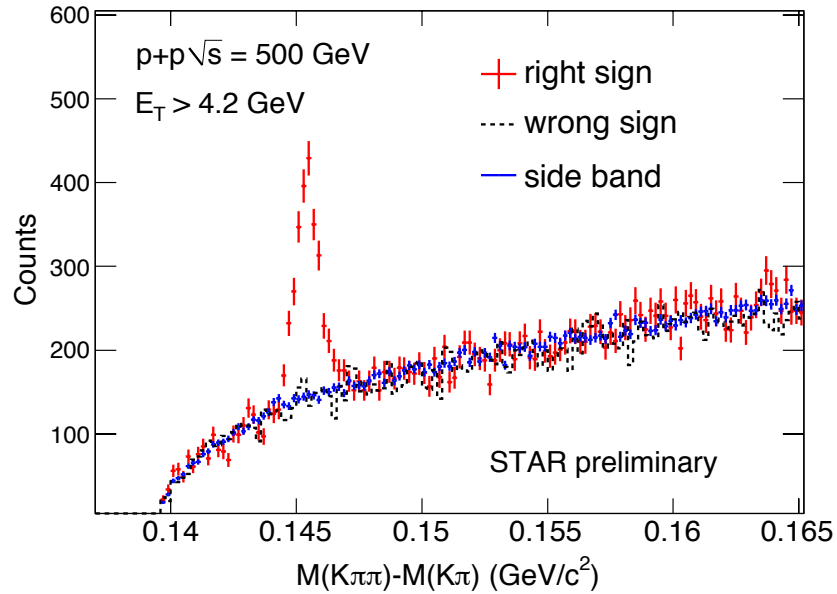
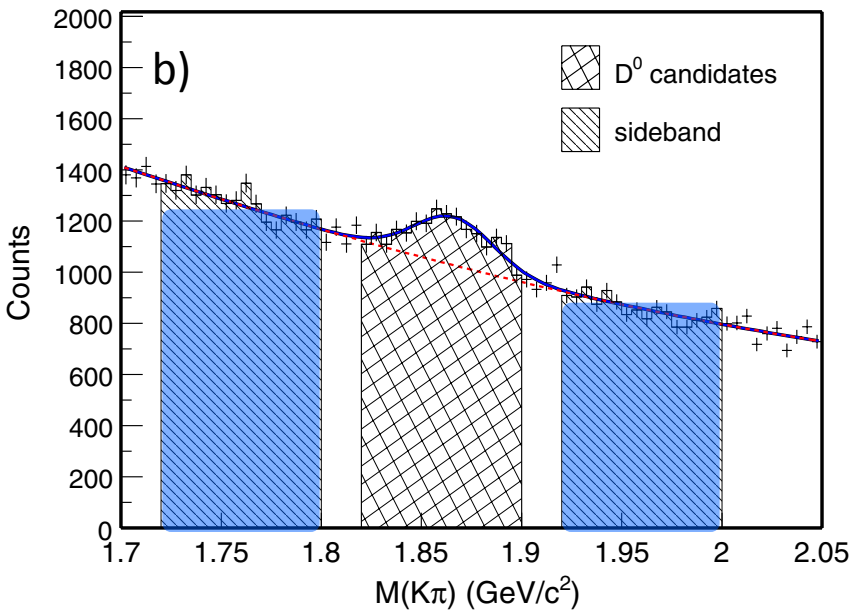
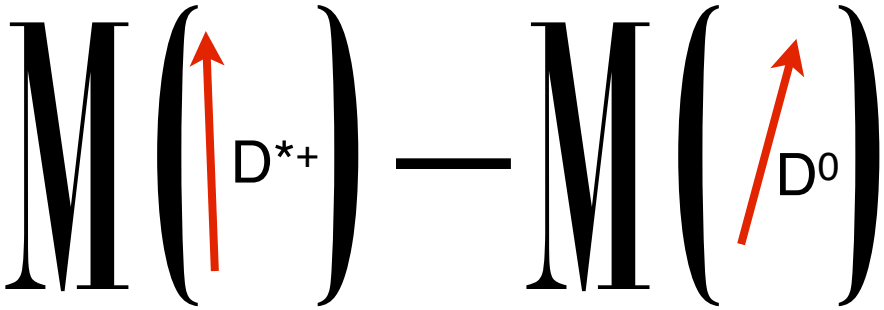
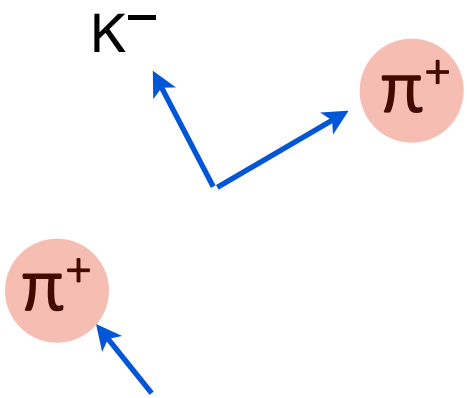


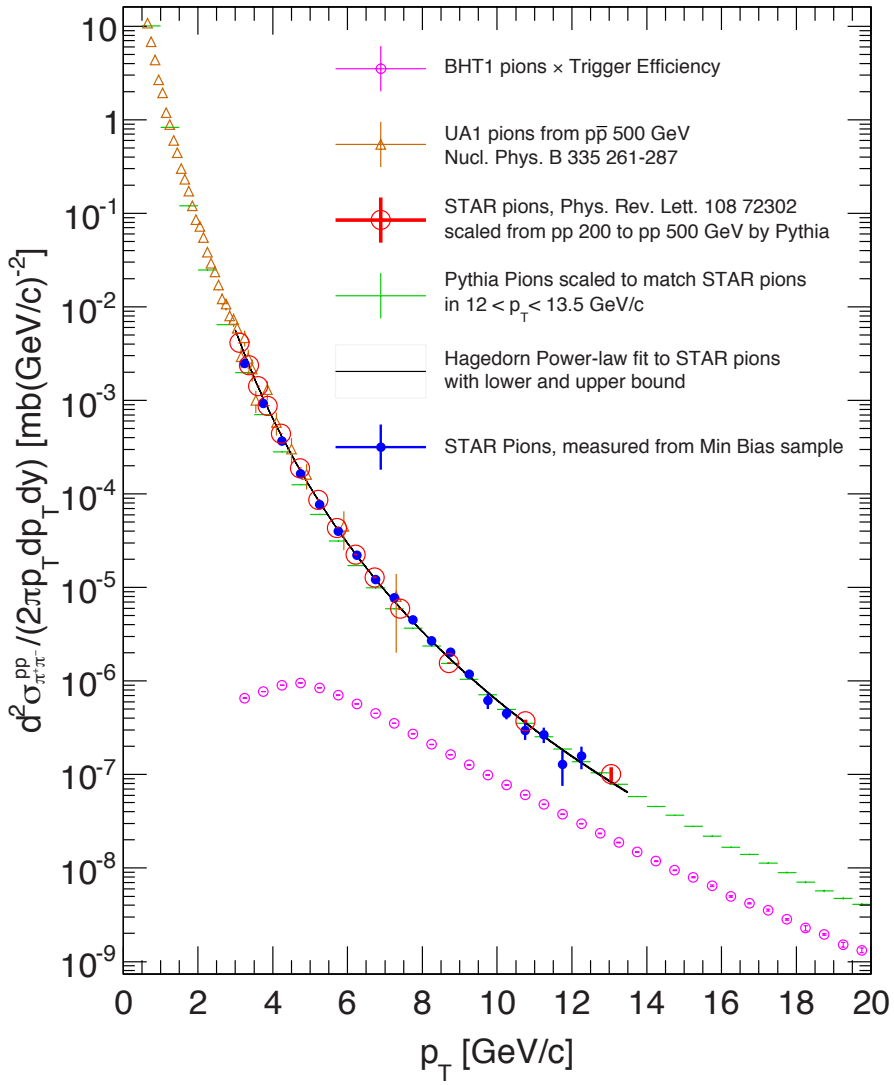




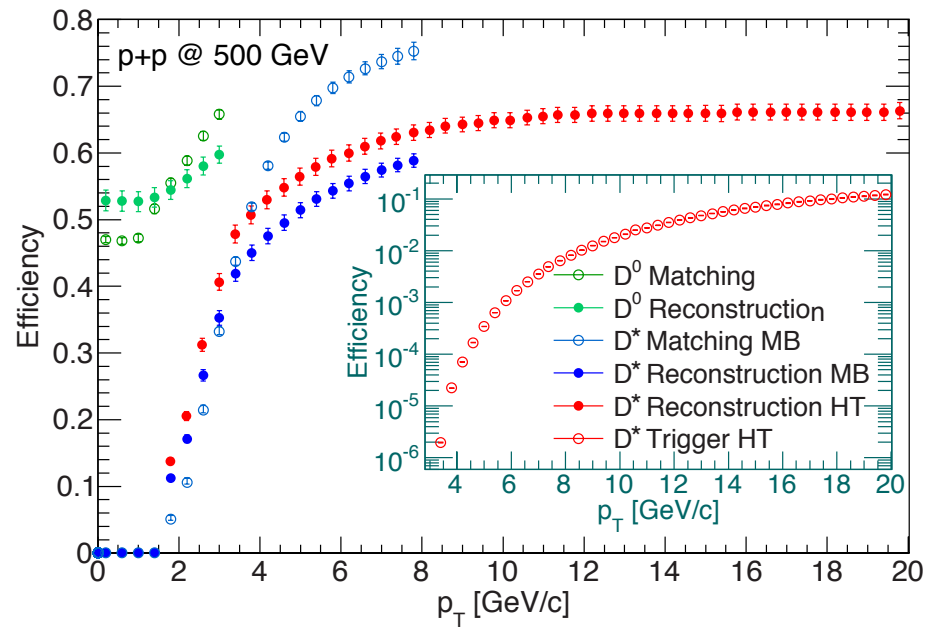


Corrections

Pion Spectra in VPDMB and BHT1

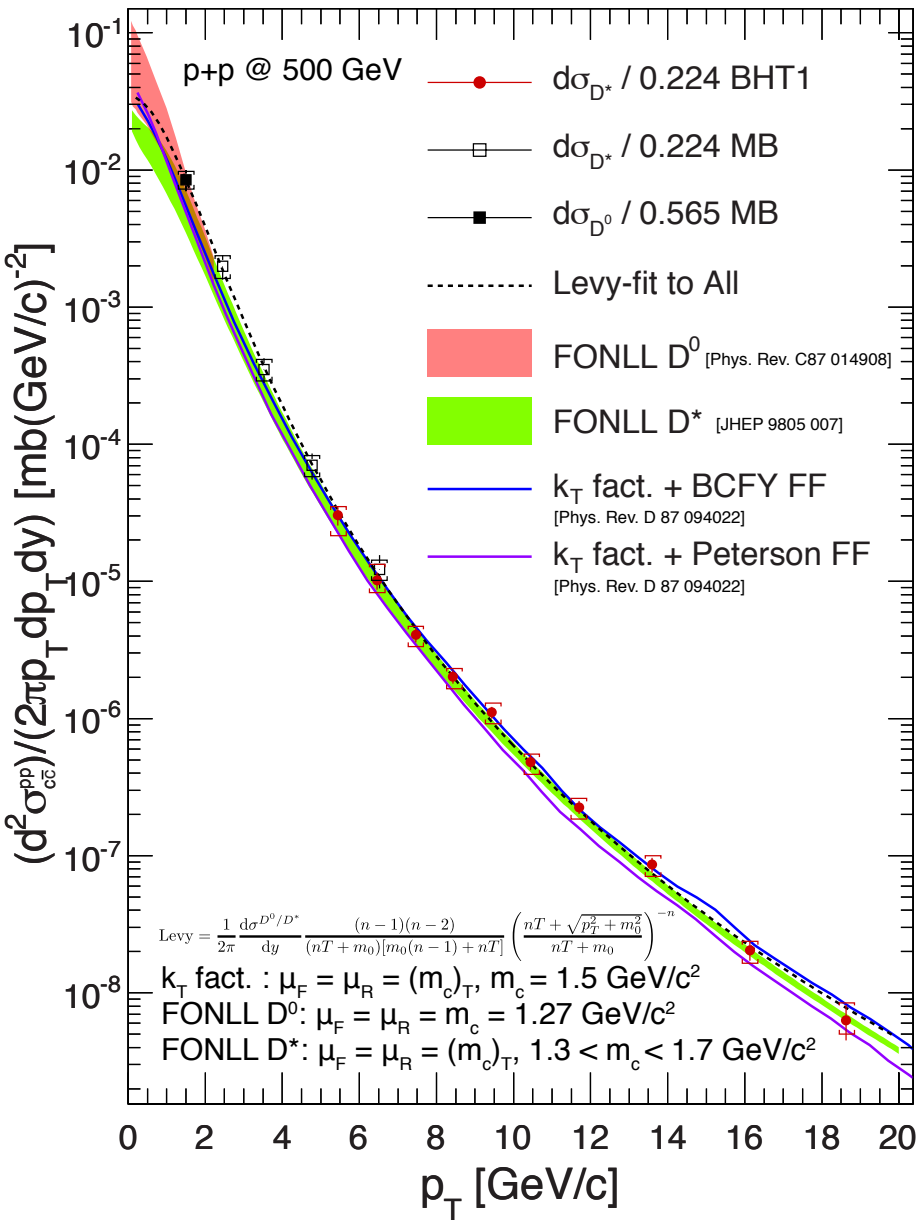


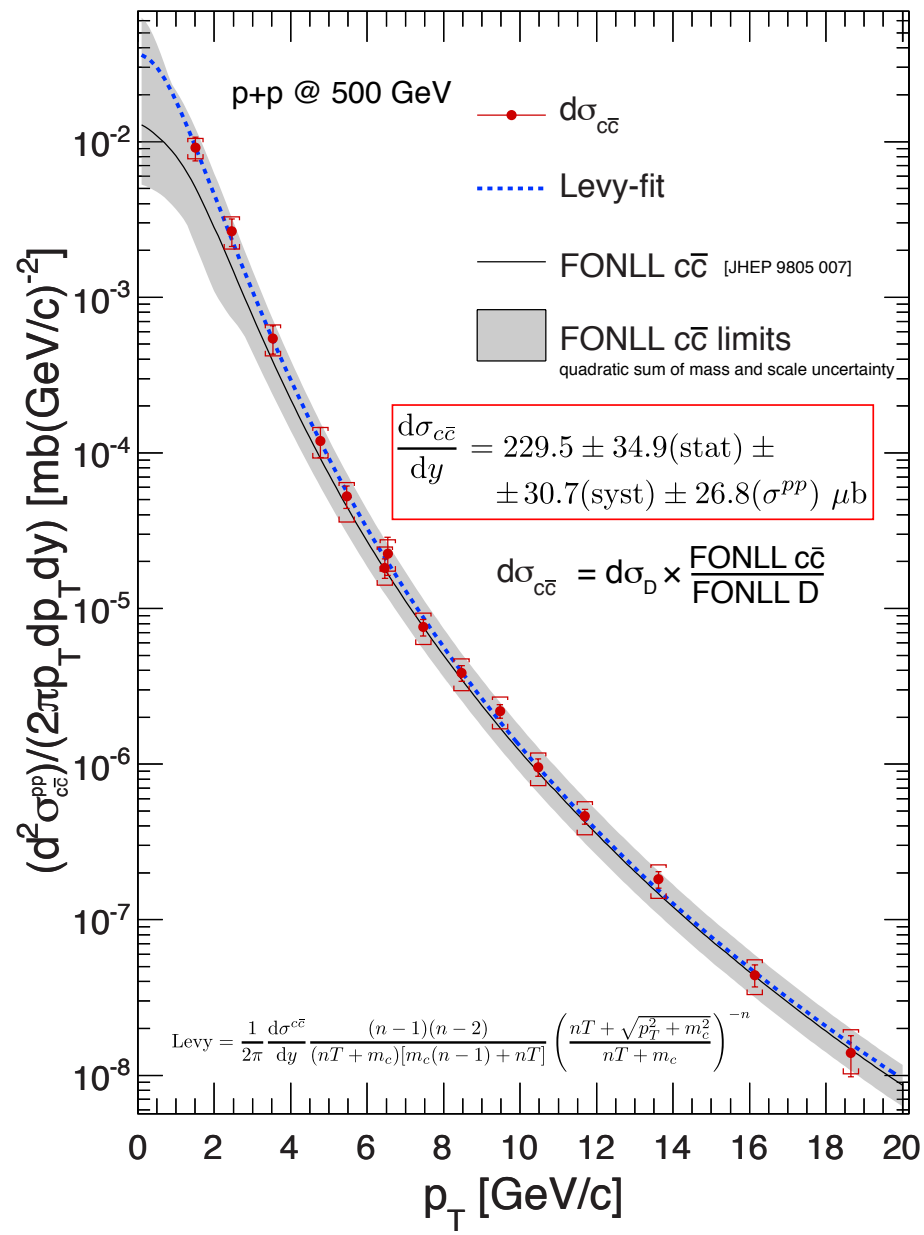
D0 & D* efficiencies



p_T [GeV/c]	1-2	2-3	3-8
VPDMB bias	0.70	0.65	0.63

Charm Cross Section at Mid-rapidity

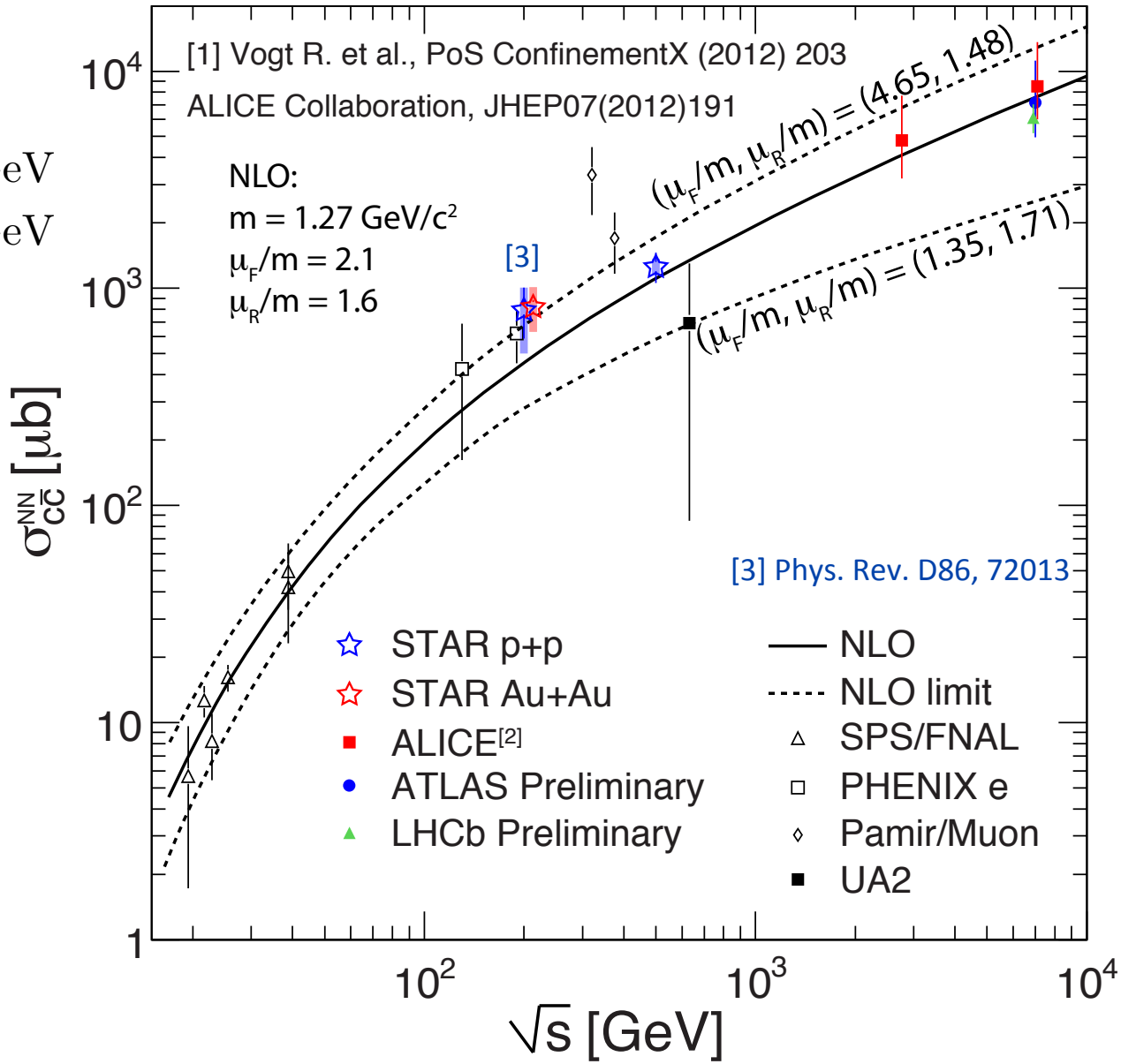




Total Charm Cross Section

Extrapolation to full rapidity from Pythia simulation:

$$\frac{d\sigma^{c\bar{c}}}{dy} \times \begin{cases} (5.6 \pm 0.1) \text{ @ } 500 \text{ GeV} \\ (4.7 \pm 0.7) \text{ @ } 200 \text{ GeV} \end{cases}$$



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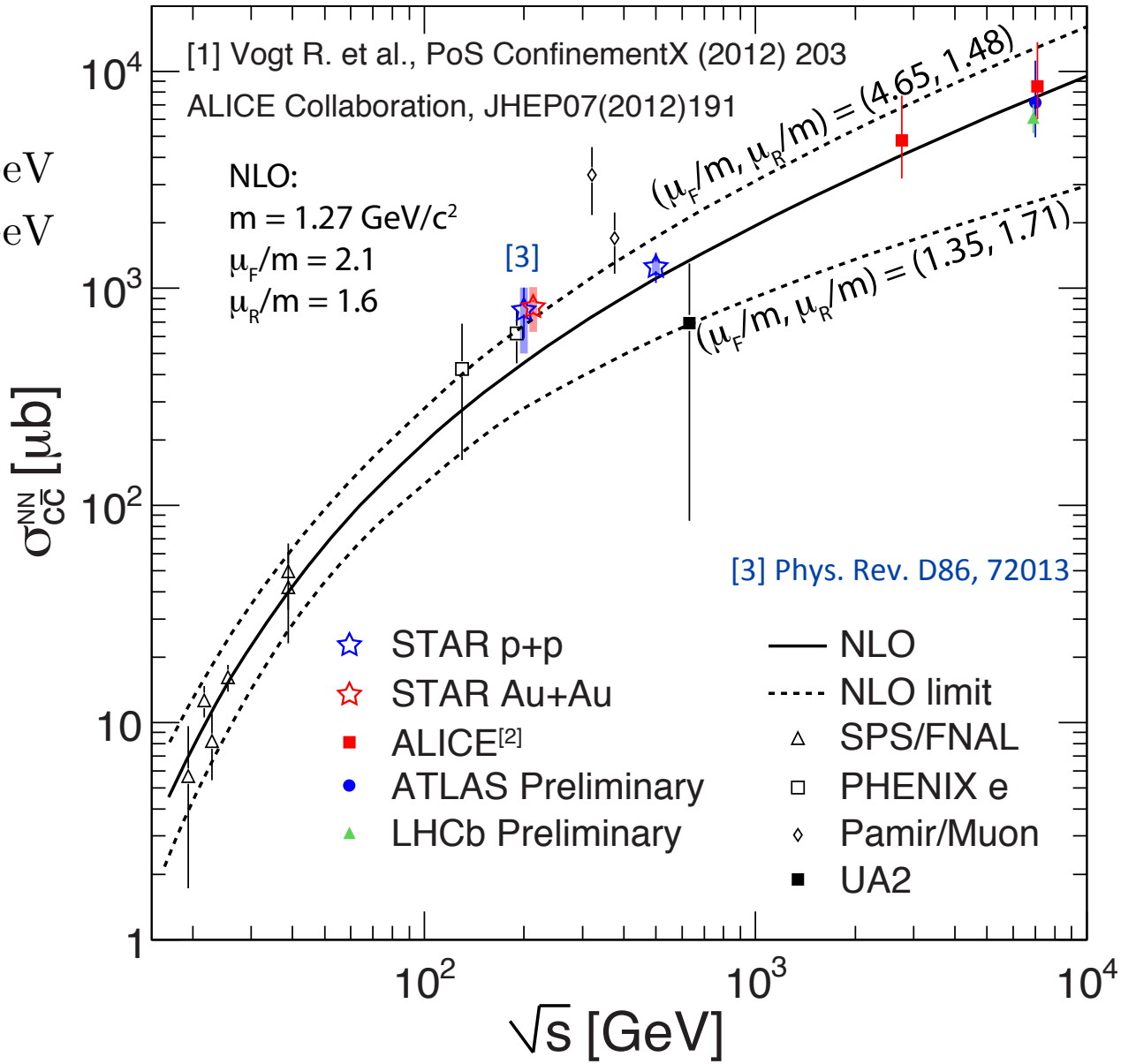
Many thanks to:

Jaro Bielcik
Xin Dong
Witek Borowski
Jamie Dunlop
Zhangbu Xu
Pavol Federic



Special Thanks To

Prof. Zdeněk Janout

Msgr. Georges Lemaître