

-- HamishGordon - 22 Jul 2008

### Results obtained 23rd July

Cuts: signal 705 at peak, background 280 at peak and 260 at maximum

No cuts: signal 1000 at peak, background 30500

### Results obtained 24th July

#### Mass cuts

1. Dstar:  $|\text{Invariant mass of DPi minus PDG mass of Dstar}| < 50 \text{ MeV}$
2. D0:  $|\text{Reconstructed mass of Dstar minus reconstructed mass of D0 minus expected mass difference from PDG}| < 20 \text{ MeV}$
3. D0:  $|\text{Invariant mass of KPi minus PDG mass of D0}| < 50 \text{ MeV}$

#### Non-mass Cuts Applied when both D0 and D\*+ are reconstructed (both loose and tight cases)

1. Minimum impact parameter significance of daughter particles K- and pi+ > 2.0
2. Transverse momentum of daughter particles K- and pi+ > 300 MeV
3. D0 transverse momentum > 1 GeV

#### Tight cuts on D0 and D\*+

1. Momentum P of daughter particles K- and pi+ lies in range  $5 < P < 100 \text{ GeV}$
2. RICH ParticleID  $\log((K-)/(pi+)) > 0$  for K-
3. RICH ParticleID  $\log((pi+)/(K-)) > 0$  for pi+
4. Decay vertex  $\chi^2/\text{DOF} < 13.0$  for D0
5. D0 PV separation significance > 15.0
6. Pi+0 (daughter of D\*+) transverse momentum > 110 MeV
7. D\*+ PT > 1.25 GeV
8. D\*+ decay vertex  $\chi^2/\text{DOF} < 13.0$

#### Loose cuts on D0

1. Momentum P of daughter particles K-/pi+ > 2 GeV
2. RICH ParticleID  $\log((K-)/(pi+)) > -5$  for K-
3. Decay vertex  $\chi^2/\text{DOF} < 25.0$  for D0
4. D0 PV separation significance > 6.0

**With all non-mass cuts and:** \* D\*+: no mass cuts: signal 100, background 82

- D\*+: mass cut on D0 mass : signal 80 background 23
- D\*+: All cuts: 85 signal events, 3 background
- D0: All cuts: 100 signal events, no background

#### No mass cuts, tight cuts on other D0 parameters

- All tight non-mass cuts: 4000 signal, 300 background, no reflection in background
- No impact parameter cut on daughter particles: 4000 signal, 300 background
- No total momentum cut on daughter particles: 4000 signal, 300 background
- Looser transverse momentum (>290) cut on daughter particles: 4000 signal, 300 background
- No RICH PiD cuts: 4000 signal, 400 background, including reflection background

**Loose cuts on D0**

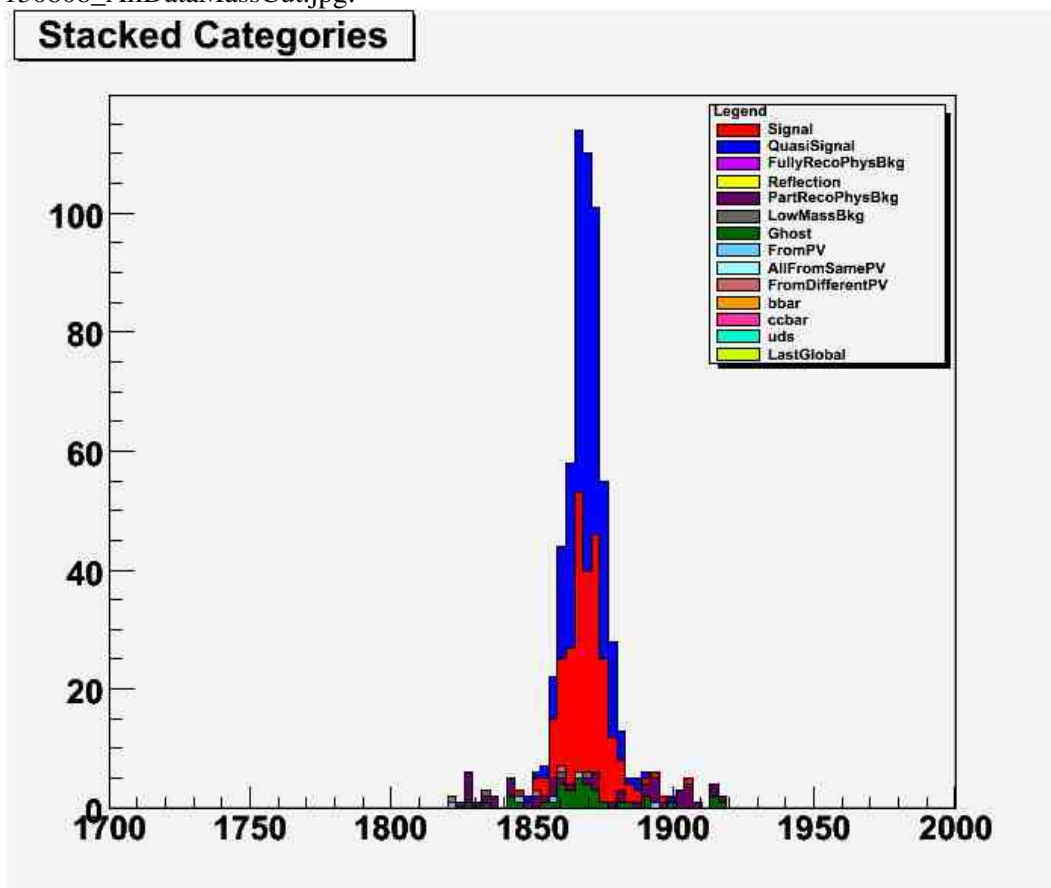
- Mass cut 3 but not cut 2 applied to D0 : 5500 signal, 100 background, narrow+isolated
- No specific mass cut applied to D0 : 5500 signal, 1000 background (ie no mass cut 2 or 3)

**D\*+ reconstruction without IPs cut on Dstar's daughter pi+**

- All cuts applied to D0 (cuts 2 and 3, tighter cuts as for Dstar below): 300 signal events, 2 ghosts, no other visible background.
- All cuts applied to D\*+: 210 signal events, 12-15 background events.
- No specific mass cut applied to D\*+: 210 signal, 200 background (no cut 1)
- No mass cut applied to D0 when reconstructing Dstar: still 210 signal, 200 background, no significant effect (no cut 3)
- Cut 2 but not cut 3 applied to D0 (tighter non-mass cuts as per D\*+ reconstruction): 260 signal, 12 background

**Background**

- With tight cuts on D0 parameters but no mass cuts, there is a fairly uniform background assigned to ghost particles, FullyRecoPhysBkg and (strangely) bbar, though the bbar rarely exceeds 10. There is also some scattered PartRecoPhysBkg and FromPV background, and concerningly some signal (about 10) that's in the wrong place.
- 130808\_AllDataMassCut.jpg:



This topic: [Sandbox > D2KPiResults](#)

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