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D0 to hhpi0 analysis

Documentation

Talks

- Mika Vesterinen, pi0 in the HLT, Hlt Ops meeting, 21st June 2013 [link](#)
- Mika Vesterinen, Update on hhpi0, Charm WG meeting, 15th May 2013 [link](#)
- Mika Vesterinen, Status of D0->hhpi0, Joint Charm/SLB WG meeting, 27th March 2013 [link](#)

Stripping-line development

- Documented in this page.
- Internal note, LHCb-INT-2013-049 [link](#).

Hlt2 line development (exclusive line)

- Documented in this page.

Location of ntuples

- LATEST version: Stripping 20, ~180 pb⁻¹
`/afs/hep.man.ac.uk/d/lhcb-charm_1/will/data_files/merged2.root`
`/castor/cern.ch/user/m/mvesteri/HHPi0/Stripping20_180pb_251112/merged.root`
`/castor/cern.ch/user/m/mvesteri/HHPi0/Stripping20_180pb_251112/options_Mika.py`
`/castor/cern.ch/user/m/mvesteri/HHPi0/Stripping20_180pb_251112/ganga_submit.py`
`/castor/cern.ch/user/m/mvesteri/HHPi0/Stripping20_180pb_251112/merge.sh`
- 2012 Data (stripping 20, ~ 681 pb⁻¹): `/castor/cern.ch/user/p/pgarosi/NtupleData2012Strip20`
- Generator level simulation produced by Frederic:
100k events of D0-->pi-pi+pi0 according to the BaBar isobar Dalitz model:
`/castor/cern.ch/user/g/gersabec/charm/pipipi0/Dalitz_100000evt.root`

Relevant codes

- DaVinci/ganga scripts live in svn here

```
SetupProject Urania v1r1 --build-env  
getpack Phys/D0ToHHPi0Analysis
```
- Original scripts from Paola, to produce ntuples of data and MC
`/afs/cern.ch/user/p/pgarosi/public/ntuple_code.`
In each sub-directory options and LFNs files.

Stripping lines

- $D^{*+} \rightarrow D^0 (K^- + \pi^0) + \pi^+$

To call the stripping lines:

- ◆ "Phys/DstarD2hhpi0PromptDst2D2RSPi0RLine/Particles" for "[D*(2010)+ -> (^D0 -> (^K*(892)0 -> ^K- ^pi+) (^pi0 -> ^gamma ^gamma)) ^pi+]cc "
 - ◆ "Phys/DstarD2hhpi0PromptDst2D2WSPi0RLine/Particles" for "[D*(2010)+ -> (^D0 -> (^K*(892)0 -> ^K+ ^pi-) (^pi0 -> ^gamma ^gamma)) ^pi+]cc "
 - ◆ "Phys/DstarD2hhpi0PromptDst2D2KKPi0RLine/Particles" for "[D*(2010)+ -> (^D0 -> (^K*(892)0 -> ^K- ^K+) (^pi0 -> ^gamma ^gamma)) ^pi+]cc "
 - ◆ "Phys/DstarD2hhpi0PromptDst2D2PiPiPi0RLine/Particles" for "[D*(2010)+ -> (^D0 -> (^K*(892)0 -> ^pi- ^pi+) (^pi0 -> ^gamma ^gamma)) ^pi+]cc "
- B⁻ D⁰ (K⁻ + 0) μ⁻

To call the stripping lines:

- ◆ "Phys/b2D0MuXKPiPi0ResolvedCharmFromBSemiLine/Particles" for "[B- -> (^D0 -> ^K- ^pi+ (^pi0 -> ^gamma ^gamma)) ^mu-]cc "
 - ◆ "Phys/b2D0MuXKKPi0ResolvedCharmFromBSemiLine/Particles" for "[B- -> (^D0 -> ^K- ^K+ (^pi0 -> ^gamma ^gamma)) ^mu-]cc "
 - ◆ "Phys/b2D0MuXPiPiPi0ResolvedCharmFromBSemiLine/Particles" for "[B- -> (^D0 -> ^pi- ^pi+ (^pi0 -> ^gamma ^gamma)) ^mu-]cc "
- B⁰ μ⁻ D^{*+} D⁰ (K⁻ + 0) +

To call the stripping lines:

- ◆ "Phys/b2DstarMuXKPiPi0ResolvedCharmFromBSemiLine/Particles" for "[B0 -> (^D*(2010)+ -> (^D0 -> ^K- ^pi+ (^pi0 -> ^gamma ^gamma)) ^pi+) ^mu-]cc "
- ◆ "Phys/b2DstarMuXKKPi0ResolvedCharmFromBSemiLine/Particles" for "[B0 -> (^D*(2010)+ -> (^D0 -> ^K- ^K+ (^pi0 -> ^gamma ^gamma)) ^pi+) ^mu-]cc "
- ◆ "Phys/b2DstarMuXPiPiPi0ResolvedCharmFromBSemiLine/Particles" for "[B0 -> (^D*(2010)+ -> (^D0 -> ^pi- ^pi+ (^pi0 -> ^gamma ^gamma)) ^pi+) ^mu-]cc "

MC samples

```
dkfiles/Dst_D0pi,Kpipi0=DecProdCut,PHSP.dec
```

```
bk_query=BKQuery (path='/MC/MC11a/Beam3500GeV-2011-MagDown-Nu2-EmNoCuts/Sim05a/Trig0x40760037Flagg
```

```
INPUTDATA = bk_query.getDataset ()
```

```
print INPUTDATA
```

Related Talks

Theory papers

- David Atwood, Amarjit Soni, Searching for the Origin of CP violation in Cabibbo Suppressed D-meson Decays, <http://arxiv.org/abs/1211.1026>
- Y. Grossman et al., Testing for new physics in singly Cabibbo suppressed D decays, <http://arxiv.org/abs/1204.3557v1>
- J. Brod et al., Size of direct CP violation in singly Cabibbo-suppressed D decays, <http://arxiv.org/abs/1111.5000>

Experimental papers

- <http://arxiv.org/abs/hep-ex/0608009> (BaBar analysis of pipipi0 and KKpi0 with 230 fb⁻¹, 2006)
- <http://arxiv.org/abs/hep-ex/0703037> (BaBar analysis of pipipi0 in B->D0 K, 2007)
- <http://arxiv.org/abs/0807.4544> (BaBar mixing analysis with Kpipi0, 2012)

Trigger studies

* Hlt efficiency table -- now including D*->pi (D->Kpipi0) MC11a

Stripping 20 signal mass plots

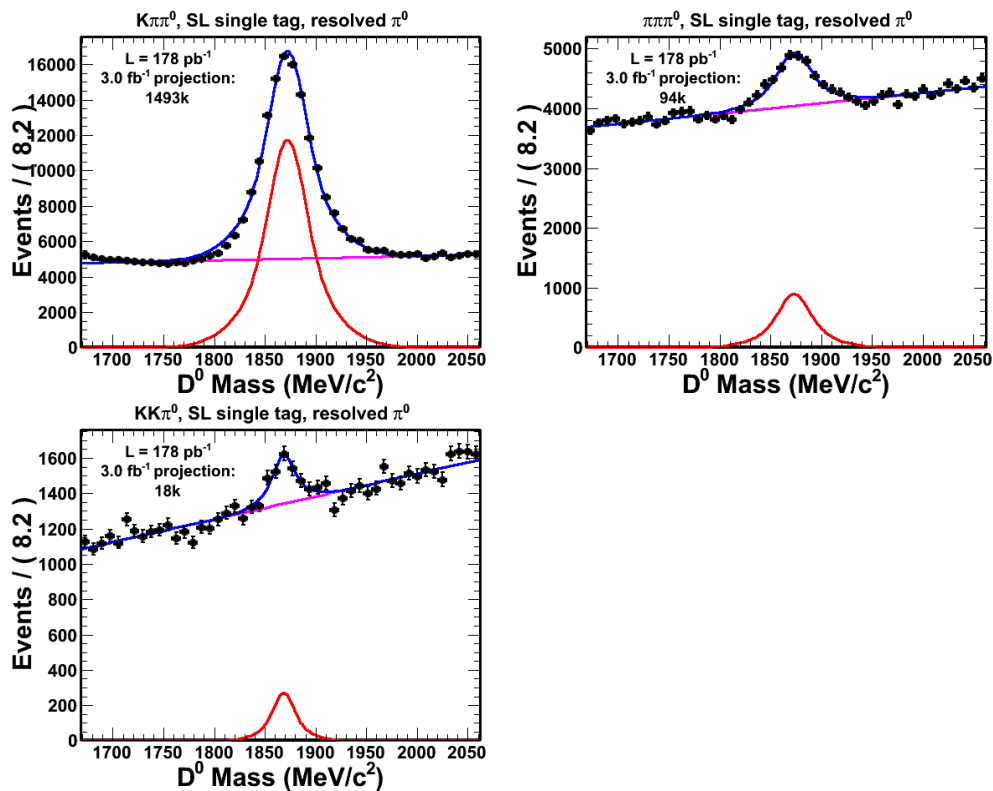
Cuts

```

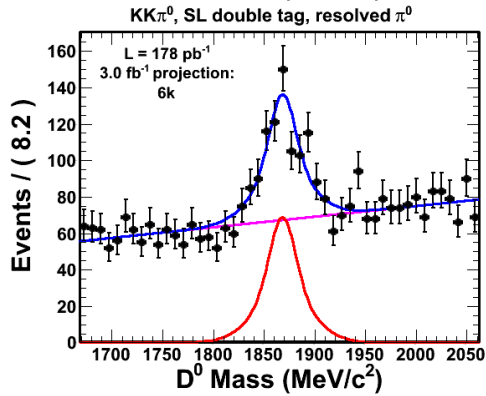
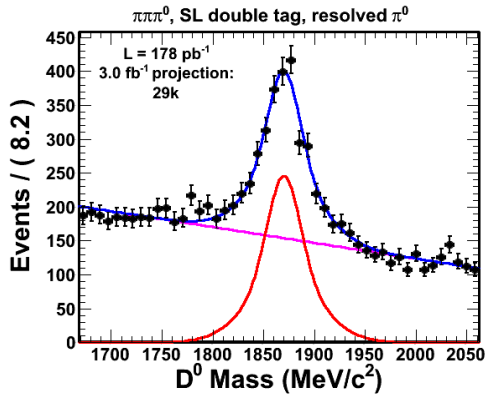
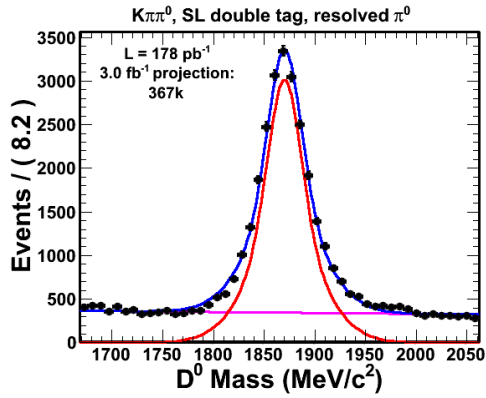
D from B:
TString cuts = "D_M > 0";
cuts += "&& nCandidate == 0";
cuts += "&& BLOGlobal_TOS == 1";
cuts += "&& BHlt1Global_TOS == 1";
cuts += "&& BHlt2Global_TOS == 1";
cuts += "&& ((pi0_M > 120 && pi0_M < 150))";
if(path.Contains("Dstr")){
  cuts += "&& Dstr_M-D_M > 142 && Dstr_M-D_M < 148";
}
Prompt:
TString cuts = "D_M > 0";
cuts += "&& nCandidate == 0";
cuts += "&& TMath::Abs(D_M-1865) < 60";
cuts += "&& (DstrL0Global_TIS == 1 || DstrL0Global_TOS==1)";
cuts += "&& DstrHlt1Global_TOS == 1";
//cuts += "&& DstrHlt2Global_TOS == 1"; //not applied
cuts += "&& ((pi0_M > 120 && pi0_M < 150))";

```

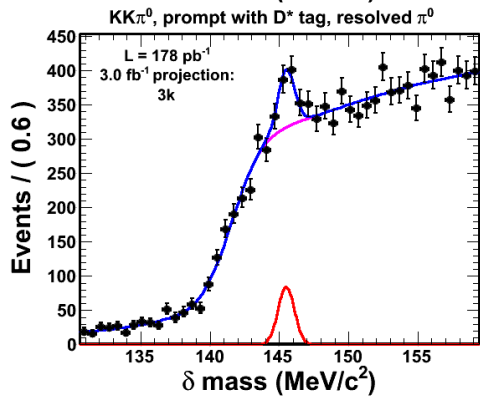
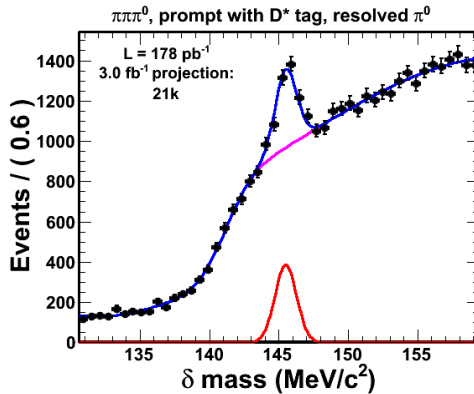
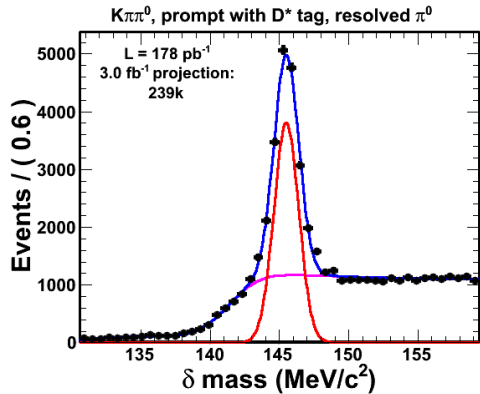
D from SL B, single tag



D from SL B, double tag



Prompt with D* tag



-- Main.MikaVesterinen

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