*The HLT2 selection of Bs K*0K*0*

Hlt2 Selection

Location: $HLTSELECTIONSROOT/options/Hlt2SelBs2Kst0Kst0.py

Variable	Offline Presel	Hlt2Sel	(Current Off. Sel)
K* Mass Window	150 MeV	150 MeV	Used Com. Prob.
K, pi minimum IPS	> 2 sigma	> 2sigma	>3 sigma
K, pi pt	All > 350 MeV	All > 350 MeV	Max > 1650 MeV
K, pi momentum	> 1000 MeV	-	same
K* chi2	< 15	< 15	< 9
K* pt	> 750 MeV	> 750 MeV	> 1250 MeV
B IPS	< 4 sigma	< 4 sigma	Same
B chi2	< 25	< 5 per DoF (= 25)	< 16
Flight Signif	> 8 sigma	> 8 sigma	> 12 sigma
Bs Mass Window	500 MeV	500 MeV	same

& uses PID

Efficiency

ε(L0/Sel)	ε(HLT1/L0&Sel)	ε(HLT2/HLT1&Sel)
41.1 %	63.5 %	89.9

SelName	ε(Hlt2Sel/HLT1&Sel)
K*0K*0	84.1 %
2Body	53.5 %
PhiPhi	2.9 %
SingleMuon	3.4 %

→ Etrig/sel = 23.5 %

P. Koppenburg , 16th Oct. (eff to **Pre**sel)

Signal	L0	Hlt1	Tk	Sel|Tk	Sel	Hlt2	Trigger
Bd2JpsiMuMuKsLLUnbiased	95%	91%	20%	69%	16%	93%	80%
Bs2Kst0Kst0	42%	62%	0%	71%	46%	84%	22%
Bd2MuMuKstar	93%	92%	58%	59%	48%	87%	74%
Dstar	39%	46%	34%	63%	22%	62%	11%
BiasedDiMuon	93%	91%	88%	62%	55%	96%	81%
B2MuMu	98%	97%	94%	78%	74%	94%	89%
Bs2PhiPhi	38%	55%	47%	73%	36%	84%	18%

Rate (P.Koppenburg 16th Oct.)

Selection	Rate	# coll	% b
L0	1 MHz	1.5	3%
Hlt1Global	37384 Hz	1.6	14%
Hlt2Global	4480 Hz	1.8	32%
B2DMuTight	65 Hz	1.8	81%
B2DVec	894 Hz	2.1	18%
B2DplusH	167 Hz	2.0	36%
B2DstarMu	1267 Hz	2.1	14%
B2HH	17 Hz	2.0	30%
B2MuTrack	648 Hz	1.7	74%
B2TwoBody	11 Hz	1.7	34%
Bd2D0Kstar	14 Hz	2.5	32%
Bd2D0Kstar_KsHH	137 Hz	2.0	16%
Bd2DstarPi	264 Hz	1.9	16%
Bd2JpsiKstar	7 Hz	1.6	13%
Bd2JpsiMuMuKsDDBiased	23 Hz	2.1	26%
Bd2JpsiMuMuKsDDUnbiased	13 Hz	2.1	25%
Bd2JpsiMuMuKsLLBiased	0 Hz	2.2	40%
Bd2JpsiMuMuKsLLUnbiased	1 Hz	2.0	33%
Bd2MuMuKstar	90 Hz	2.1	28%
BiasedDiElectron	214 Hz	1.6	32%
BiasedDiMuon	294 Hz	1.8	63%

Selection	Rate	# coll	% b
Bs2DsDs	445 Hz	1.9	18%
Bs2DsH	232 Hz	2.0	17%
Bs2DsRho	246 Hz	2.4	16%
Bs2EtacPhi	8 Hz	2.8	20%
Bs2JpsiEta	19 Hz	2.1	45%
Bs2JpsiEtap	1 Hz	2.4	80%
Bs2JpsiPhi	33 Hz	1.8	15%
Bs2Kst0Kst0	37 Hz	2.5	16%
Bs2PhiPhi	1 Hz	2.0	25%
Bu2D0K_KPi	0 Hz	1.5	100%
Bu2D0K_KsDD	1 Hz	1.5	28%
Bu2JpsiK	14 Hz	1.6	16%
Bu2LLKHighMass	7 Hz	1.6	29%
Bu2LLKJpsi	0 Hz	2.0	0%
Bu2LLKSignal	7 Hz	1.6	13%
DrellYan	44 Hz	1.7	34%
Dstar	149 Hz	1.8	28%
HidValley	19 Hz	3.0	9%
SingleMuon	925 Hz	1.7	68%
UnbiasedBs2PhiPhi	31 Hz	1.7	10%
UnbiasedDiMuon	158 Hz	1.7	24%

Timing (P.Koppenburg 16th Oct)

Hlt2SeedReco	246	33.777
Hlt2SharedDs2KKPi	3706	24.647
Hlt2SharedDplus2KKPi	3685	20.362
Hlt2SharedDplus2KPiPi	3706	10.805
Hlt2SharedDplus2PiPiPi	3685	10.677
Hlt2SelB2DVec	1421	6.441
Hlt2SharedKstar2KPi	3706	4.944
Hlt2SharedD02KPi	3706	2.391
Hlt2SlowPions	3706	2.278
Hlt2SelBs2DsDs	1838	2.260
Hlt2SharedRhoPlus2PiPi0	2035	1.534
Hlt2SharedD02KK	3706	1.490
Hlt2SharedD02PiPi	3706	1.433
Hlt2SelBs2Kst0Kst0	3706	1.322
Hlt2SharedPhi2KK	3706	1.316
Hlt2SelUnbiasedBs2PhiPhiFi	3706	1.286
Hlt2SharedRho0	1575	1.207
Hlt2SharedKsLL	3706	1.149
Hlt2SharedD02KsKK	738	1.128
Hlt2SharedRhoPlus2KPi0	1443	1.081
SelEtapForHlt2SelBs2JpsiE	830	0.962

Conclusions

- Reasonable HLT2 efficiency
- High rate & timing
- We can :
  - Tune the Hlt2 cuts in the range presel – sel, better IP & pt of K, pi
  - Look at other variables: (isolation)

```
Hlt2SelBs2Kst0Kst0.PhysDesktop.InputLocations  = ["Phys/Hlt2SharedKstar2KPi"]
Hlt2SelBs2Kst0Kst0.DecayDescriptor = "B_s0 -> K*(892)0 K*(892)~0"

daughtercuts = "(PT>750*MeV) & (VFASPF(VCHI2/VDOF)<15) & (ADMASS('K*(892)0')<150*MeV)"
daughtercuts += " & (INTREE((ABSID=='pi+')& (PT > 350 * MeV) & (MIPCHI2DV(PRIMARY)>4)))"
daughtercuts += " & (INTREE((ABSID=='K+') & (PT > 350 * MeV) & (MIPCHI2DV(PRIMARY)>4)))"

Hlt2SelBs2Kst0Kst0.DaughtersCuts = {"K*(892)0" : daughtercuts }

Hlt2SelBs2Kst0Kst0.CombinationCut = "(ADAMASS('B_s0')<500*MeV)";

Hlt2SelBs2Kst0Kst0.MotherCut = "(VFASPF(VCHI2/VDOF)<5) & (BPVIPCHI2()<16) & (BPVVDCHI2>64)"
```