Reconstruction of K0s, Lambda, and anti-Lambda using MinBias 7 TeV data

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Initial Goals

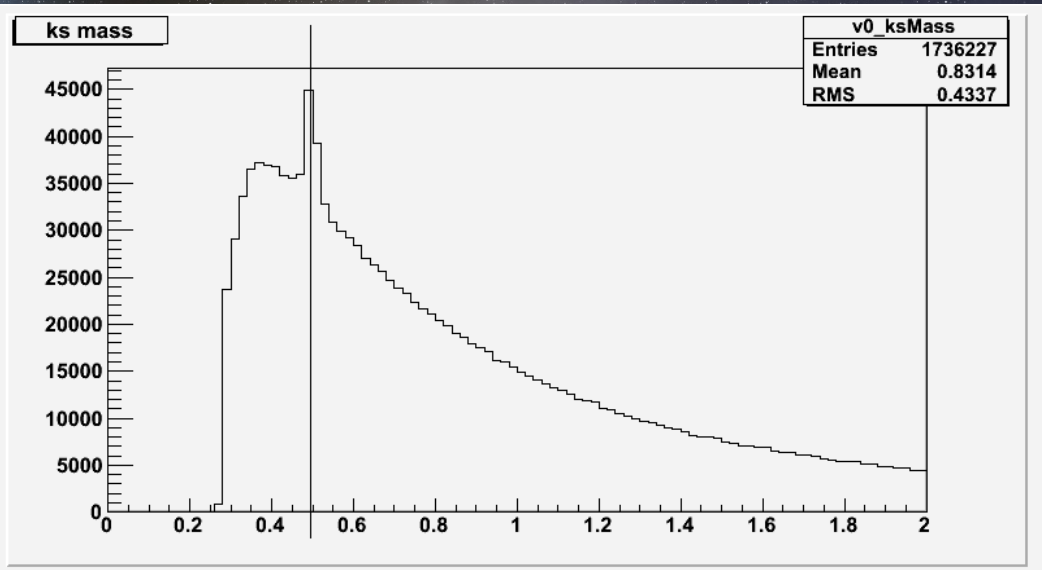
- Reconstruct K0s mass peak
- Compare with MC predictions (PYTHIA MinBias) (width/peak)
- Optimize selection cuts to maximize S/B ratio
- Reconstruct pT/Eta spectrum and compare with MC
- Look at the Dalitz plot
- Reconstruct K0K0 mass spectrum (if 2 candidates are found in an event)
  - S/B ratio should be further increased
  - do we see K0K0 resonances (f(1520 etc..)
- Look at Lambda/Lambda(bar) (if time allows)

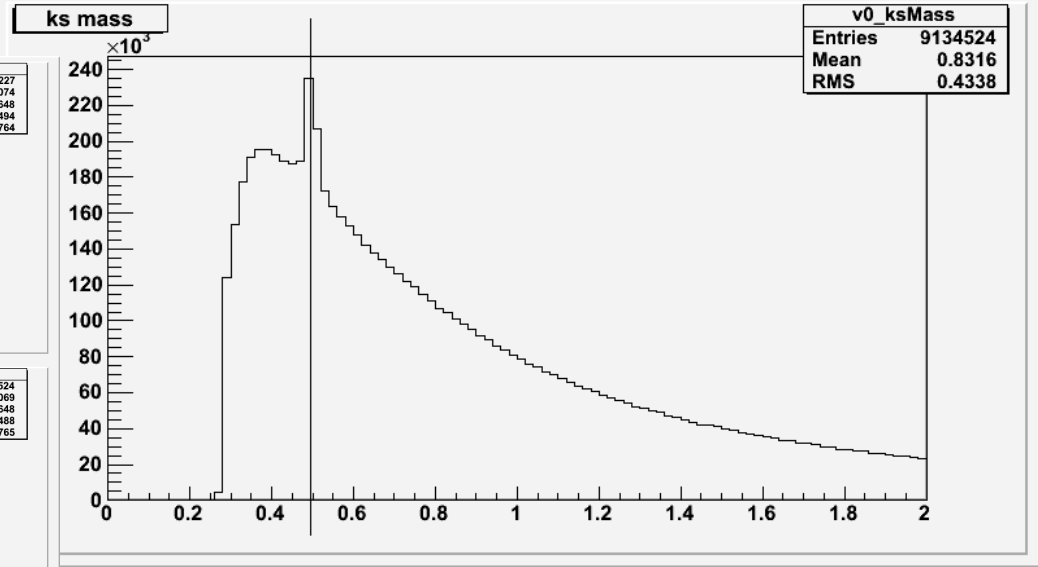
Main Programs

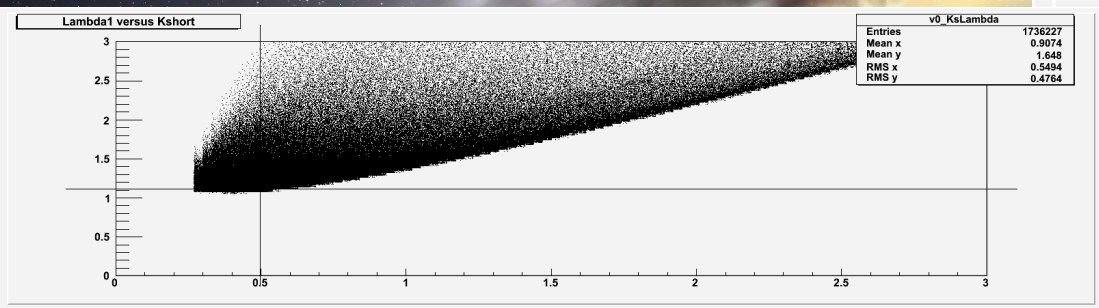
Using MinBias D3PD ntuples on the PC farm (7 Tev data), Intg. Lumi= 400 mb-1
D3PD contains V0 information
Using C++/ROOT program
Computer farm to process data

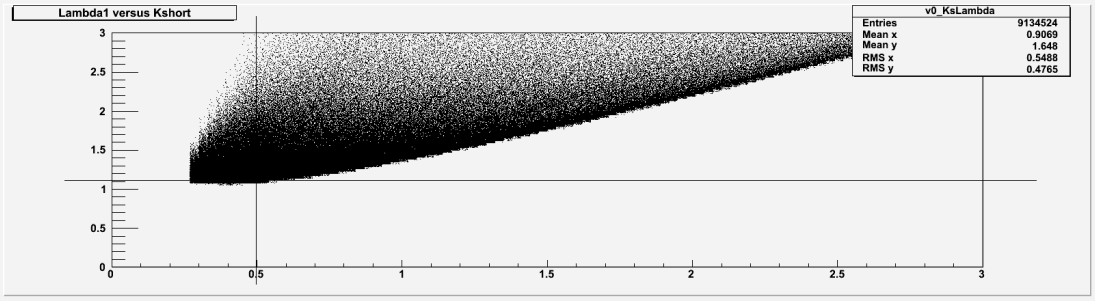
Early MC vs DATA

No cut optimization



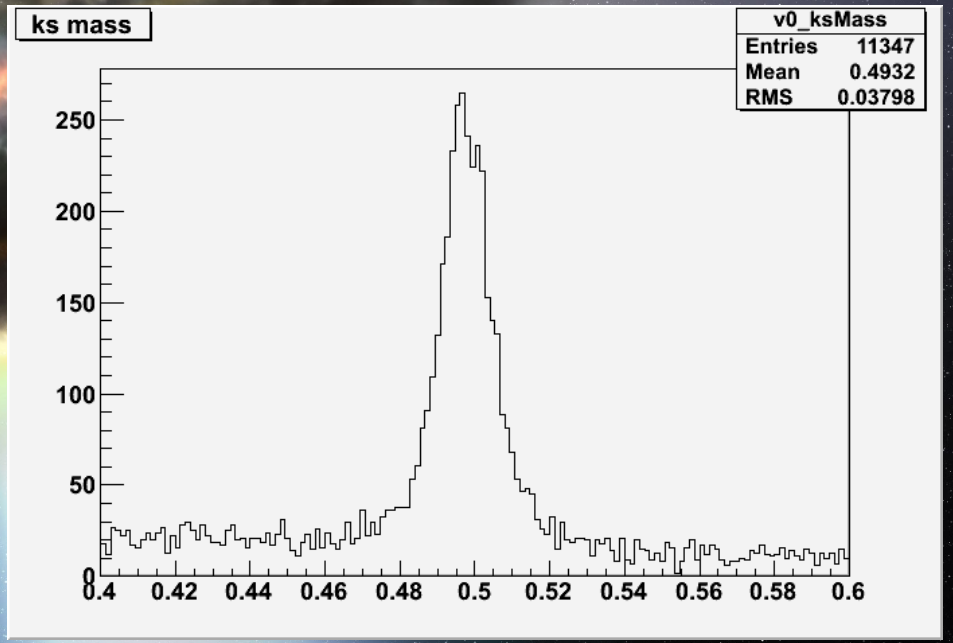






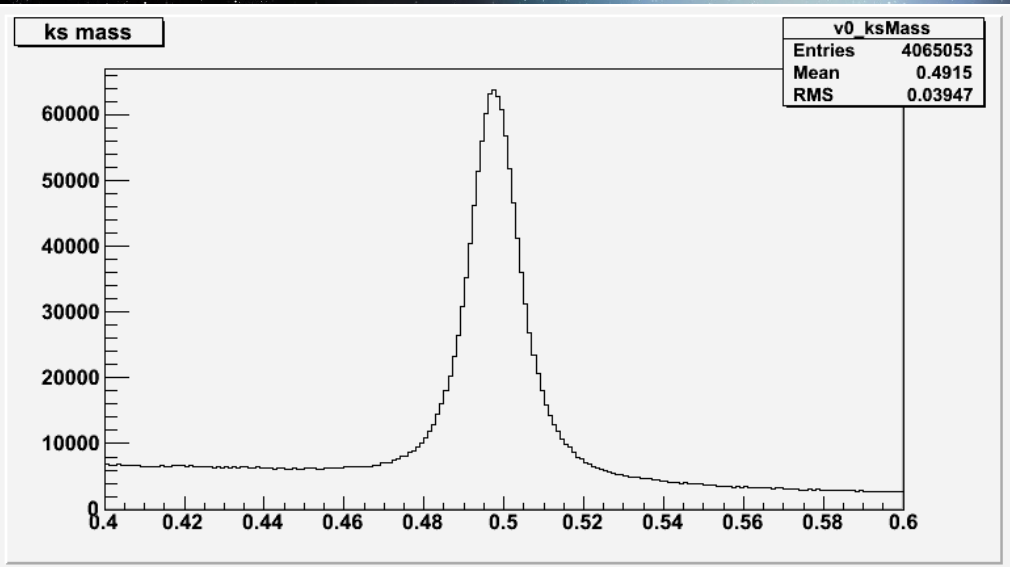
K0short cuts

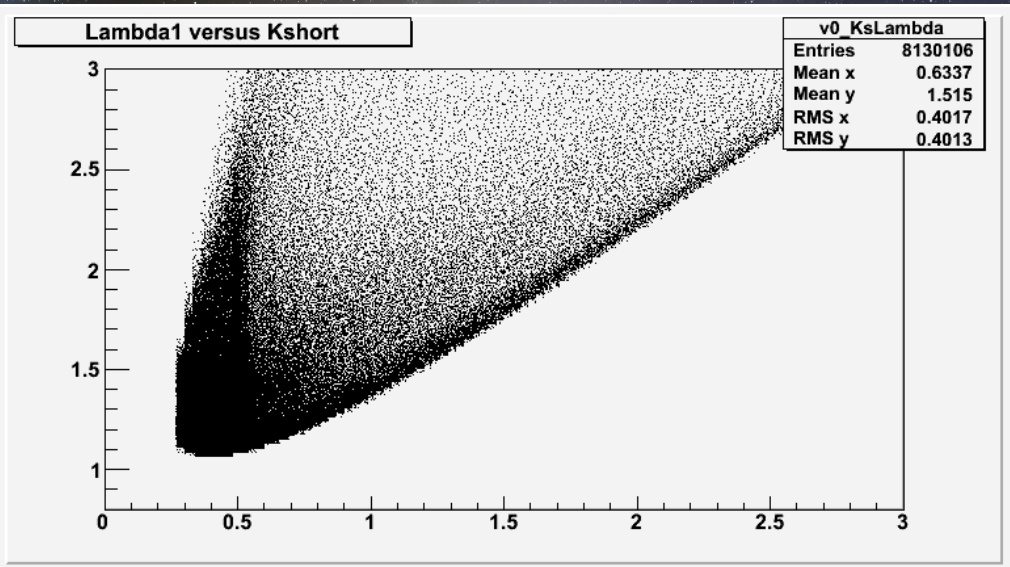
- Event cuts
  - MinBias MBTS_1 trigger
  - PileUp cleaning cut
  - Vertex selection, cut for 2 tracks, etc
- Cuts on tracks:
  - |eta|<MaxEta
  - pt>MinPt
  - |d0|>5mm or |z0|>5mm
- Cuts on V0:
  - fabs(v0_costhetapointing)>.999
  - v0_totalFlightDistance>4
  - v0_properDecayTime>11

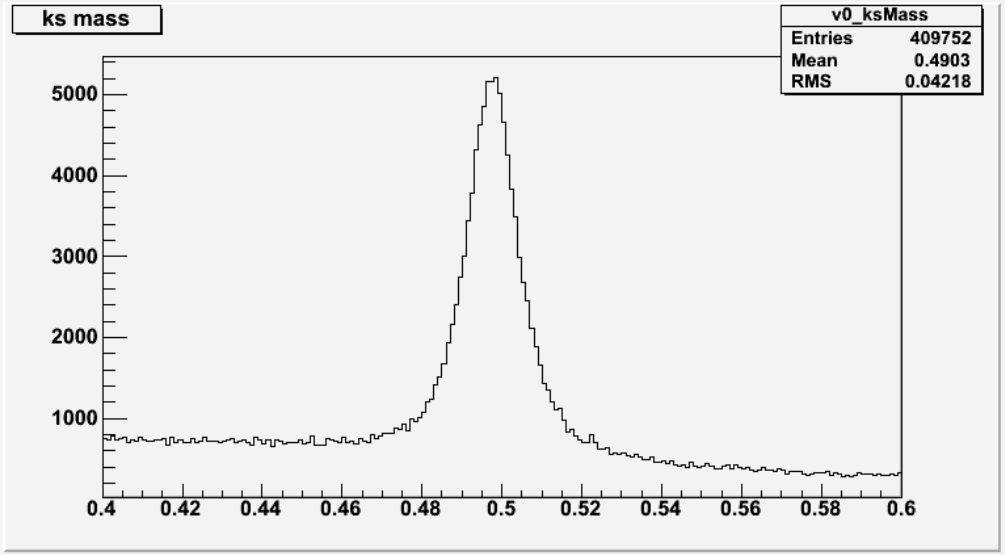


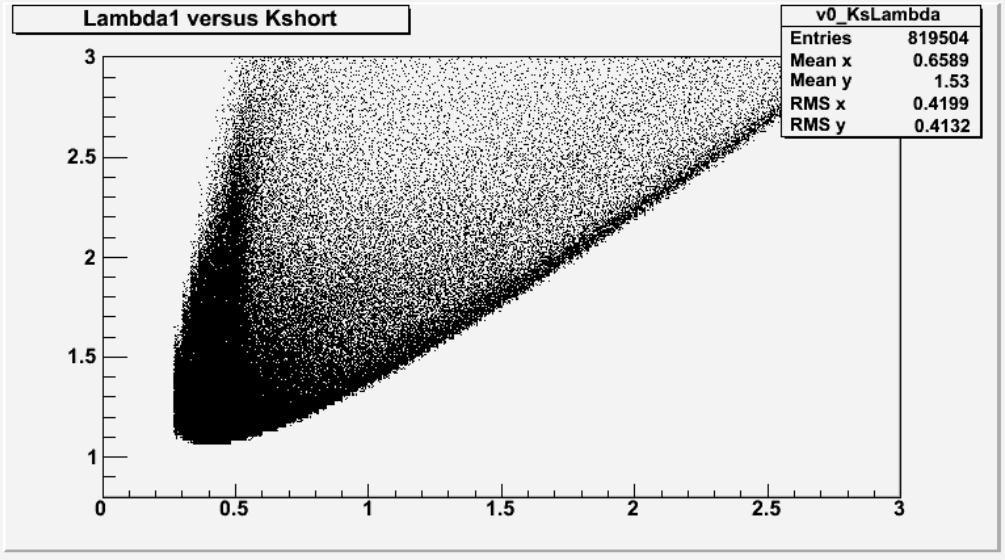
MC

Later MC vs Data



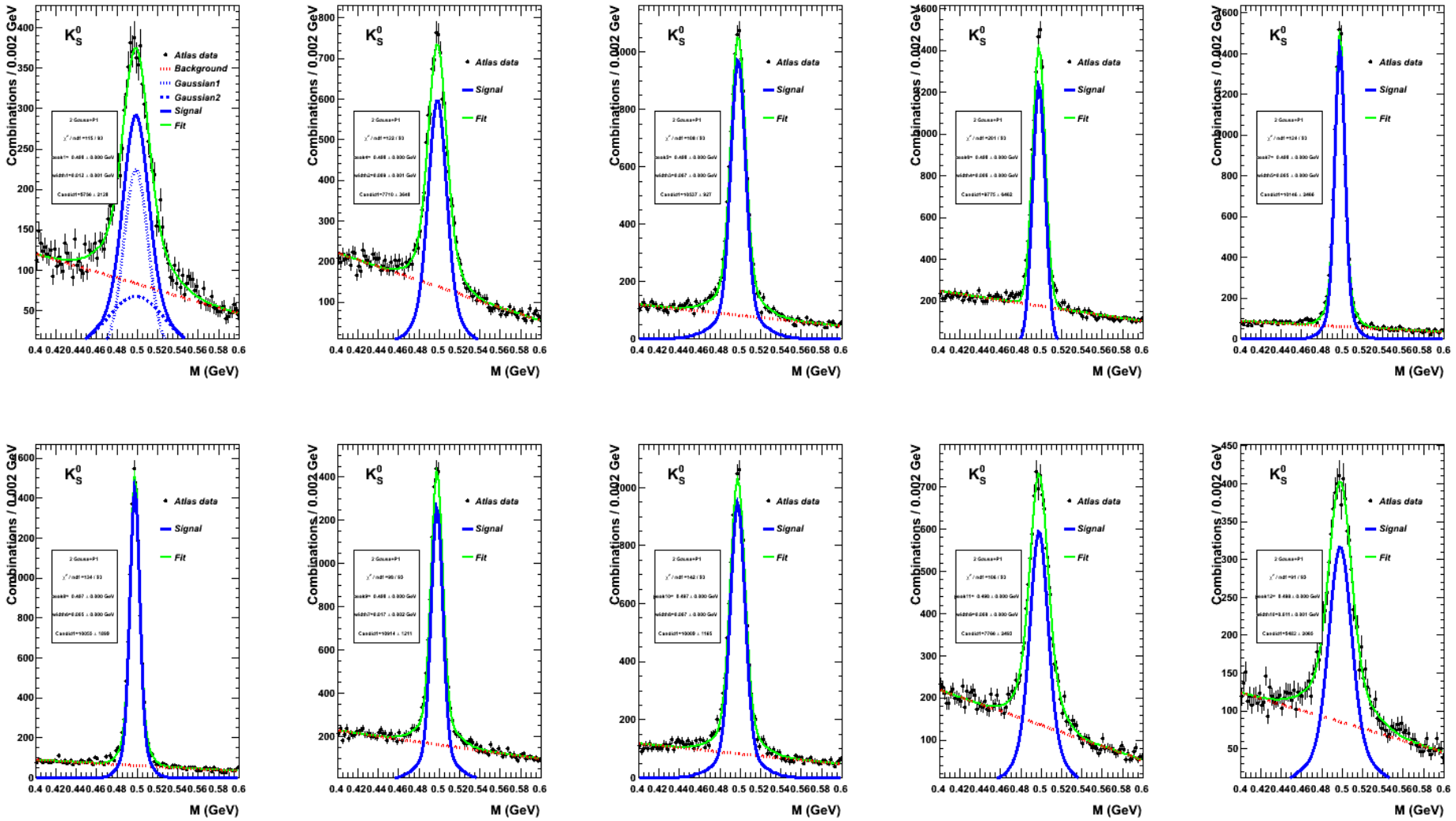






MC is on top here

Number of K0short candidates for Pt and Eta Range

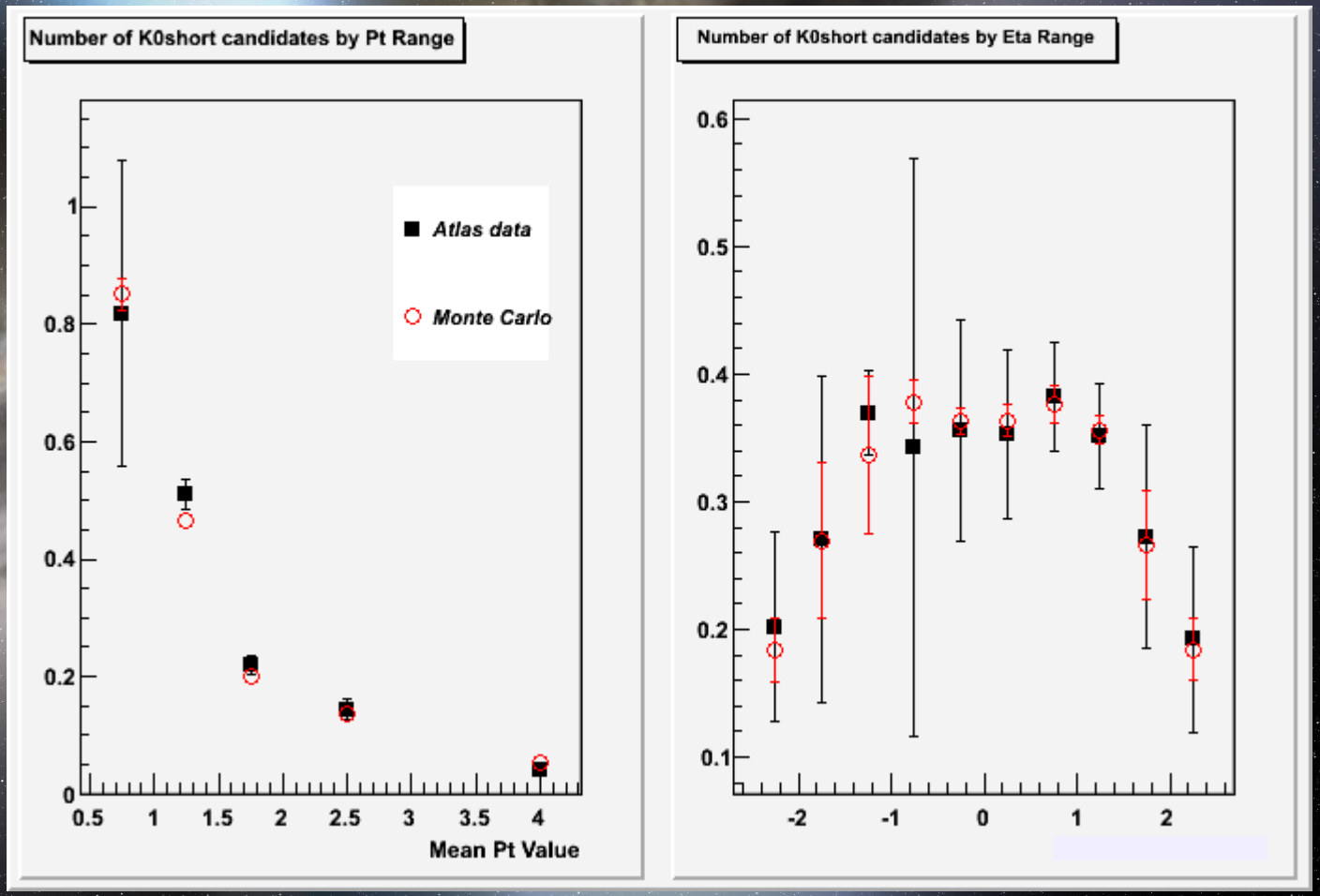


- Dividing integral by bin width
- if (v0_ksEta->at(j) >-2.5 && v0_ksEta->at(j) <=-2.0) {
  h.v0_Eta1Mass->Fill (v0_ksMass->at(j)/GeV); }

K0short candidates by Pt and Eta Range

Red is MC here

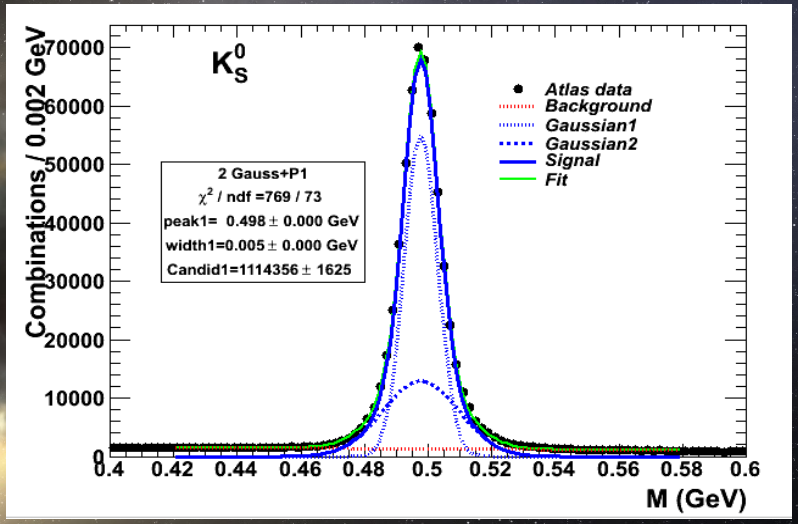
- Method
  - conjoin.cxx
- Consistent with QCD predictions?
- Conclusions



K0short additional cuts

Additional Cuts on V0:

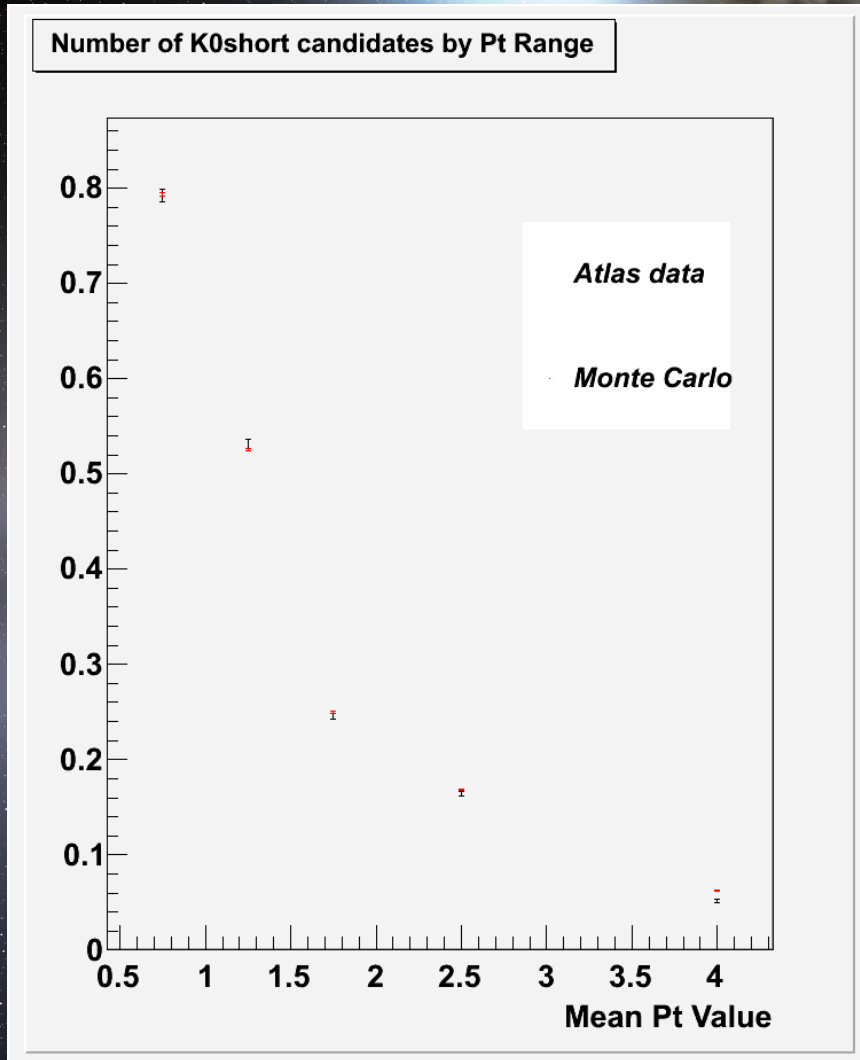
- fabs(v0_costhetapointing)>.99995
- Reject 1.0753<Lambda1Mass<1.1561
- Reject 1.0753<Lambda2Mass<1.1561

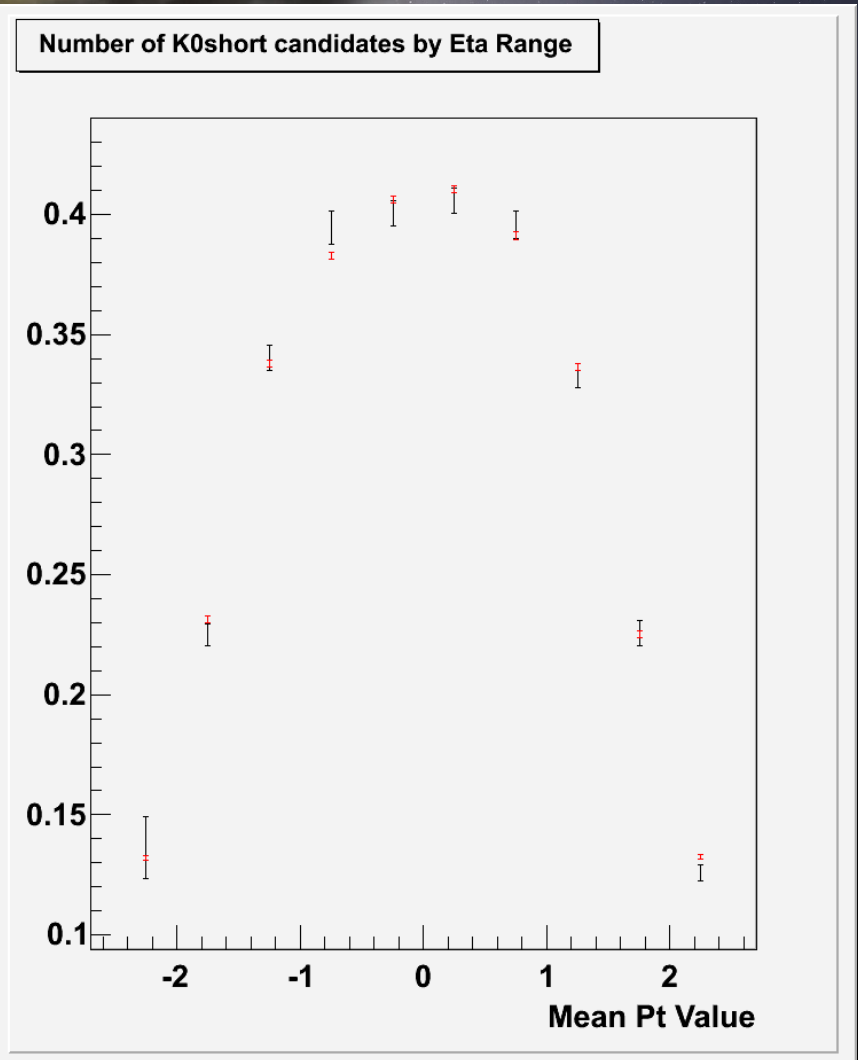


SetParameter(3,30)

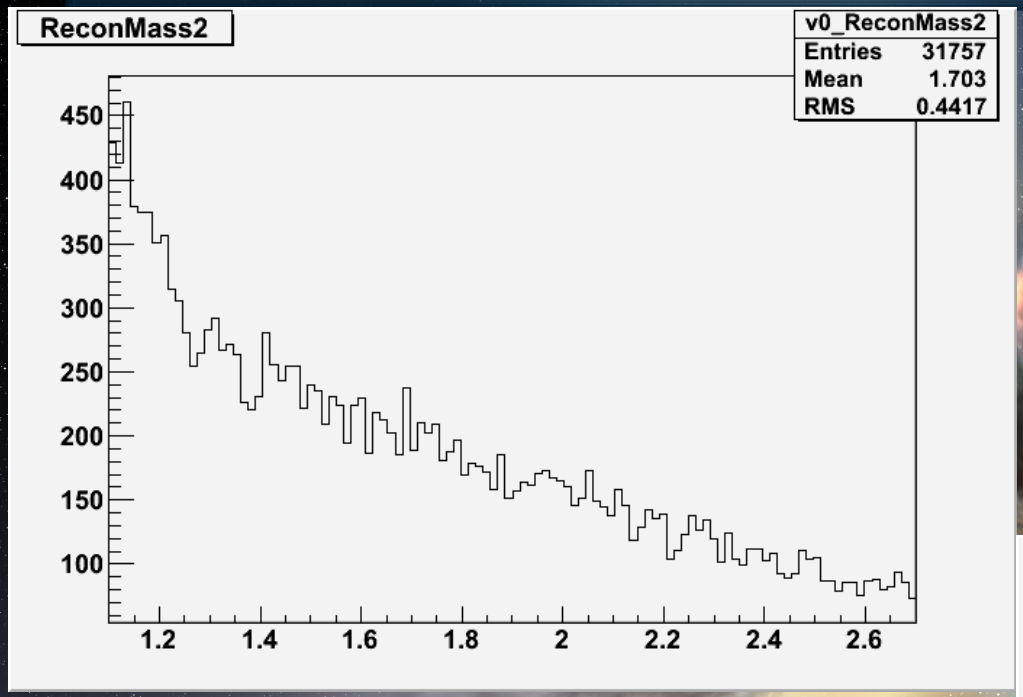
Variable	cosThetaPointing>	P/B ratio	#Candidates	CandError	Chi2/dof	Fraction of Candidates	(Fraction)*(P/B ratio)
ksMass	0.99900	13.3377	2100536	2819	1246/73	1	13.34
Cut1	0.99950	16.6415	2008647	2647	1231/73	0.96	15.91
Cut2	0.99960	17.8862	1969621	2588	1173/73	0.94	16.77
Cut3	0.99965	18.6339	1944096	2555	1145/73	0.93	17.25
Cut4	0.99970	19.5469	1912171	2517	1134/73	0.91	17.79
Cut5	0.99975	20.7011	1871280	2469	1098/73	0.89	18.44
Cut6	0.99980	22.1103	1817159	2412	1047/73	0.87	19.13
Cut7	0.99985	24.0182	1740520	2338	1000/73	0.83	19.9
Cut8	0.99990	26.8098	1622072	2229	900/73	0.77	20.7
Cut9	0.99995	31.7392	1392945	2031	769/73	0.66	21.05
Cut10	0.99996	33.2460	1316637	1967	699/73	0.63	20.84
Cut11	0.99997	35.3406	1216104	1881	653/73	0.58	20.46
Cut12	0.99998	38.0781	1076717	1761	601/73	0.51	19.52
Cut13	0.99999	42.4585	847535	1549	469/73	0.4	17.13

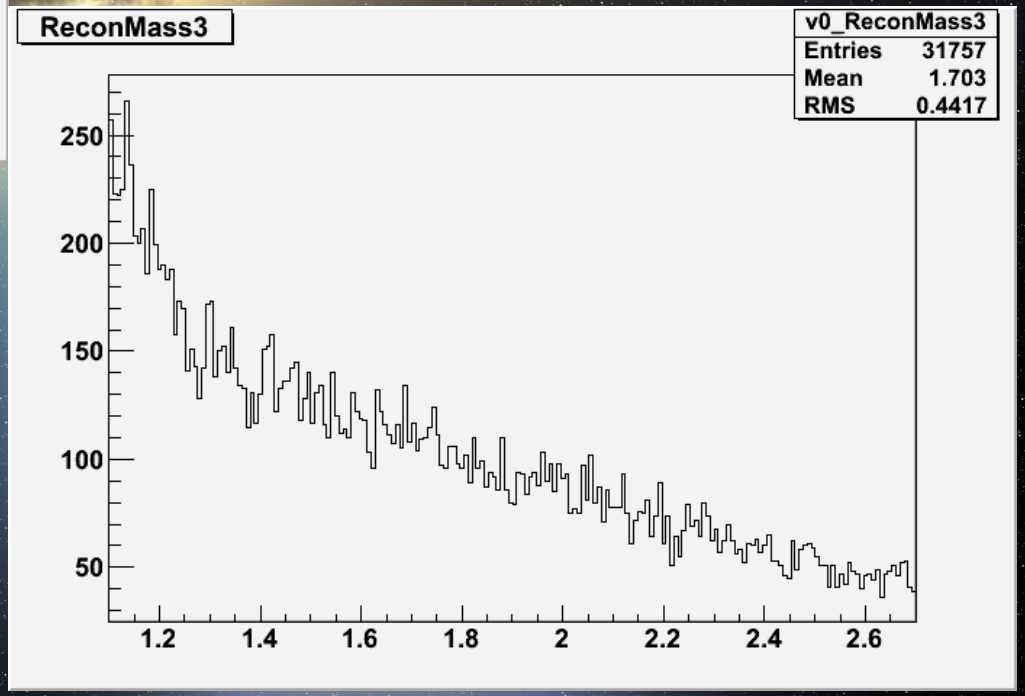
K0short candidates by Pt and Eta Range



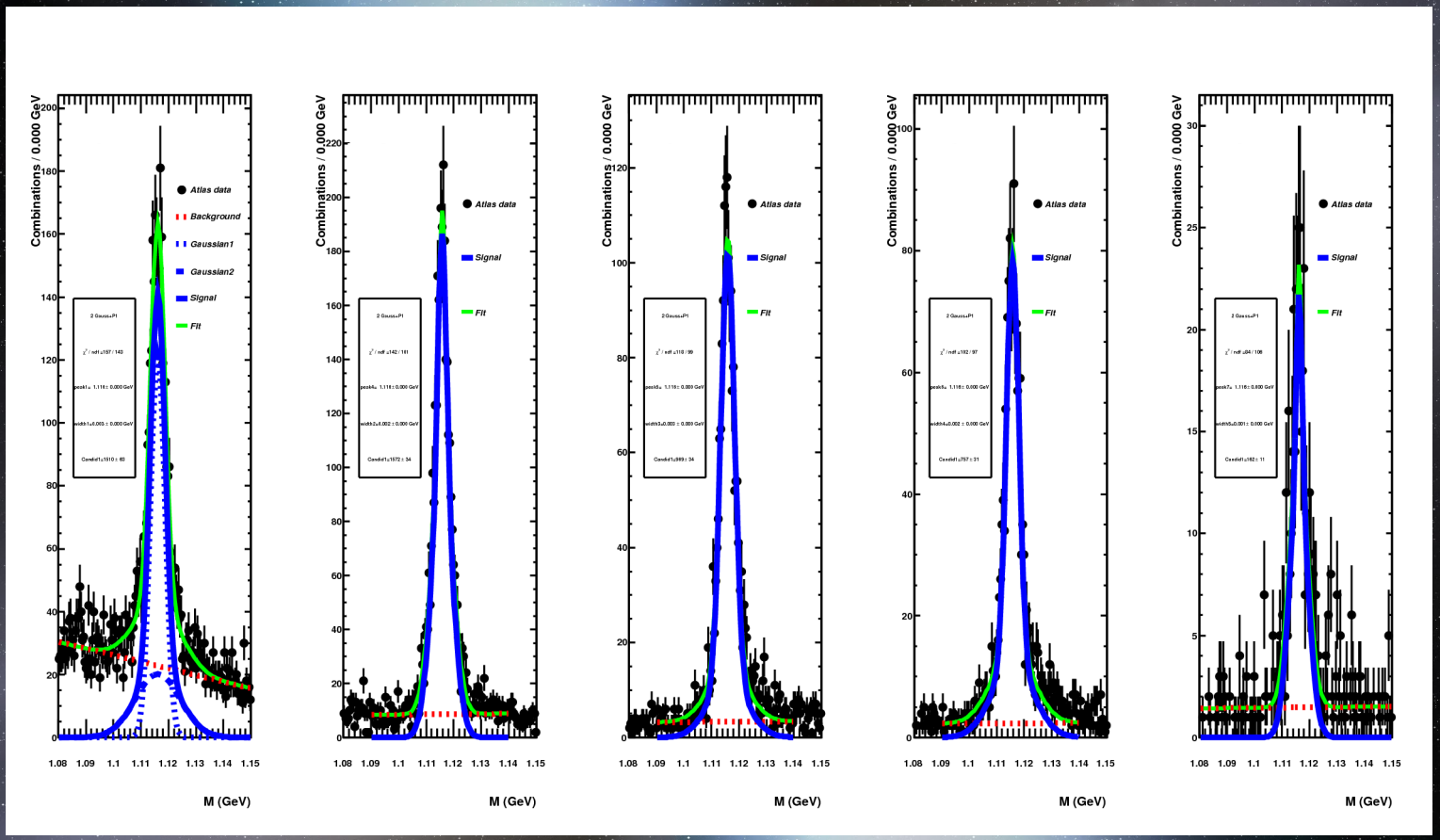


K0s-K0s invariant mass histogram



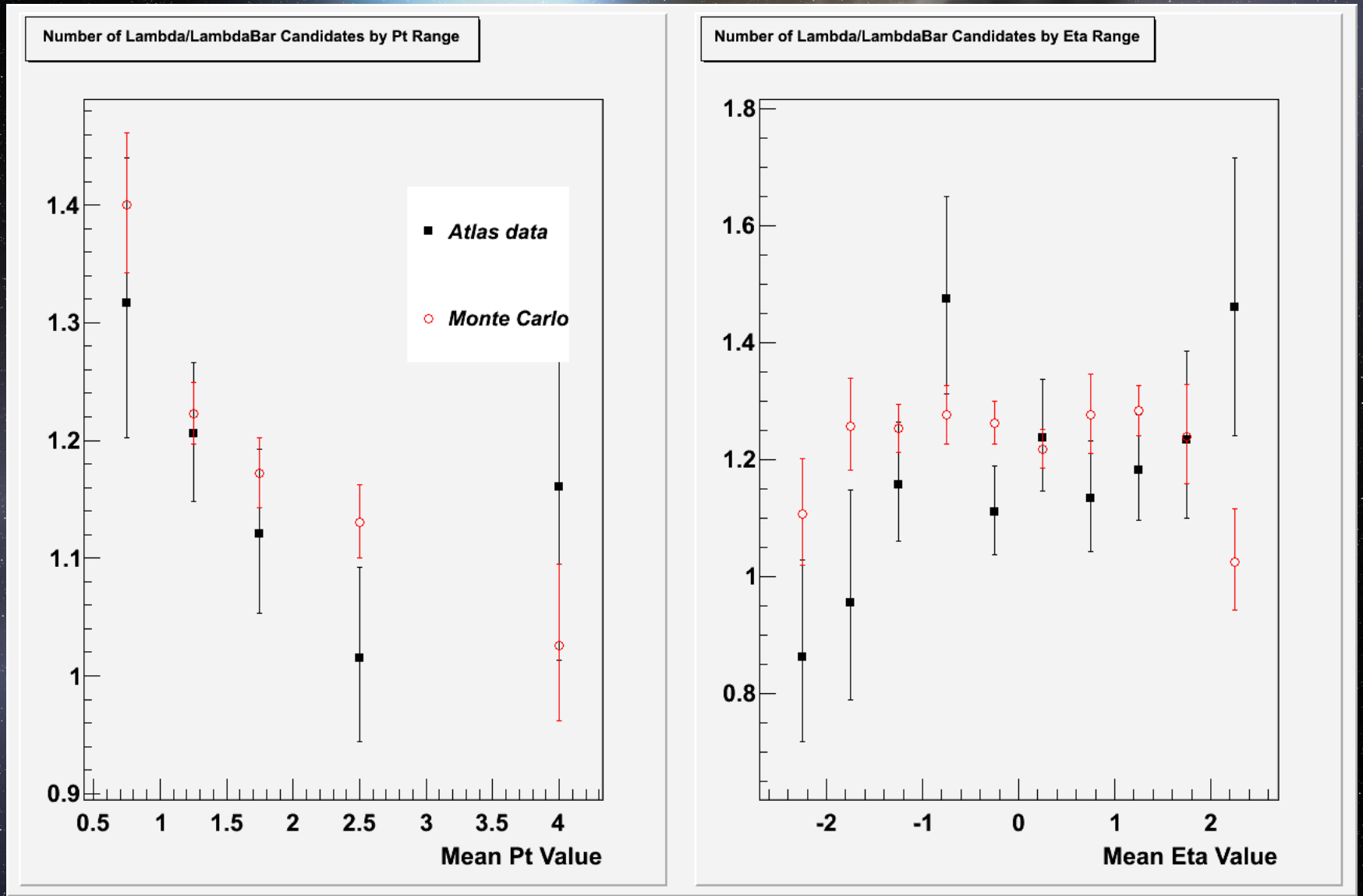


Calculating lambda candidates



KsPt > .450
|Eta|<2.5
|cosThetaPointing|>.99995
Total Flight Distance>4mm
Proper Decay Time>11
Reject .47<KsMass<.525
v0_m<340
Reject 0.9<thetaStarPiMinus<2.2

Lambda to anti-Lambda ratio



Conclusions

PtEtaCandidates
ReconMass
Lambda anti-Lambda

Future Goals

- Further reducing the K0short and lambda background
- Cut out photon conversions
- More events in K0s-K0s invariant mass plot
- Ratio between the calculated number of MC candidates within a certain pseudorapidity range and the true value of MC candidates in that range, to predict the actual number of K0short, lambda, and anti-lambda particles that emerged
- Divide the invariant mass histogram into many histograms by eta range, fit each eta range with a single Gaussian, and recombine all these Gaussians to produce the signal. This would be more time-consuming but would yield a more systematic calculation of the number of K0short, lambda, and anti-lambda candidates.