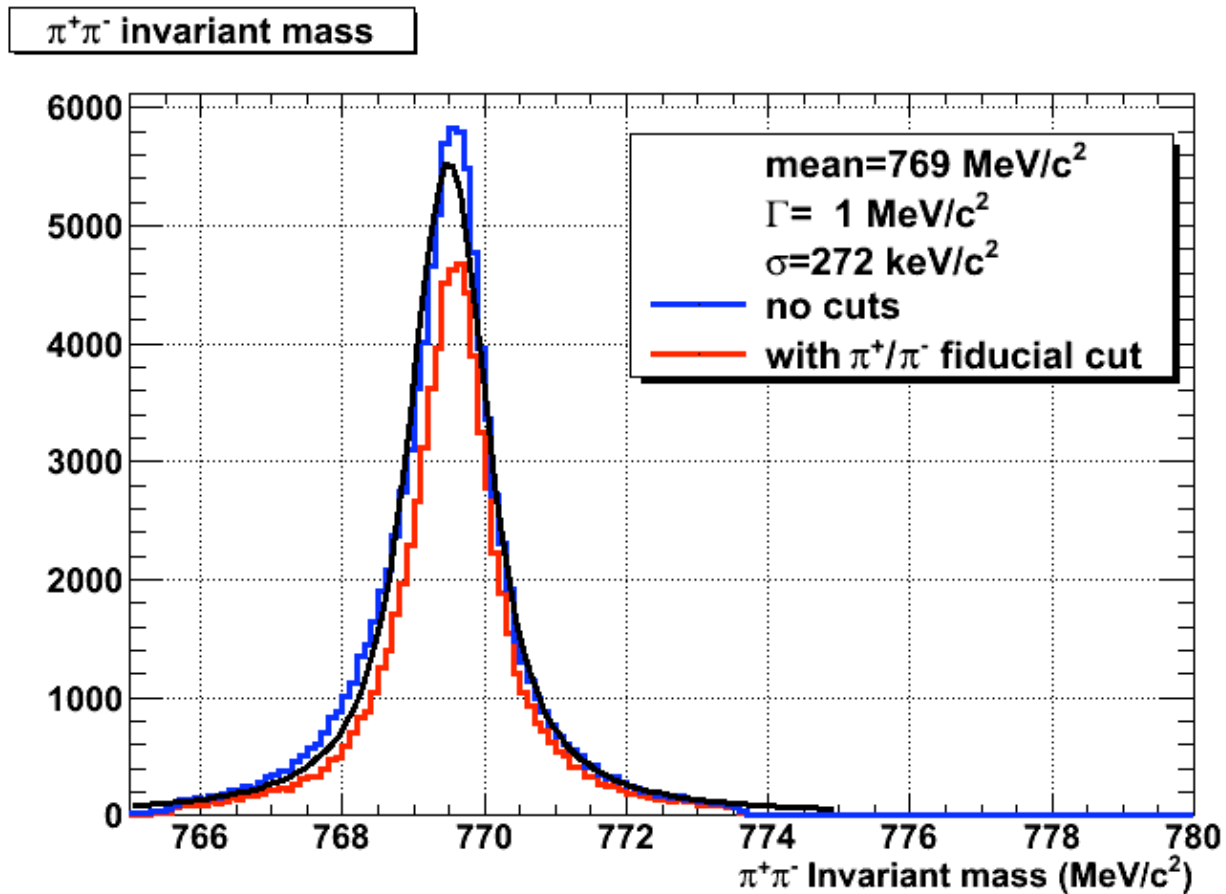


Status of $\gamma \rightarrow \rho p$ simulation study

David Lawrence JLab

Oct. 19, 2009

Thrown ρ mass distribution

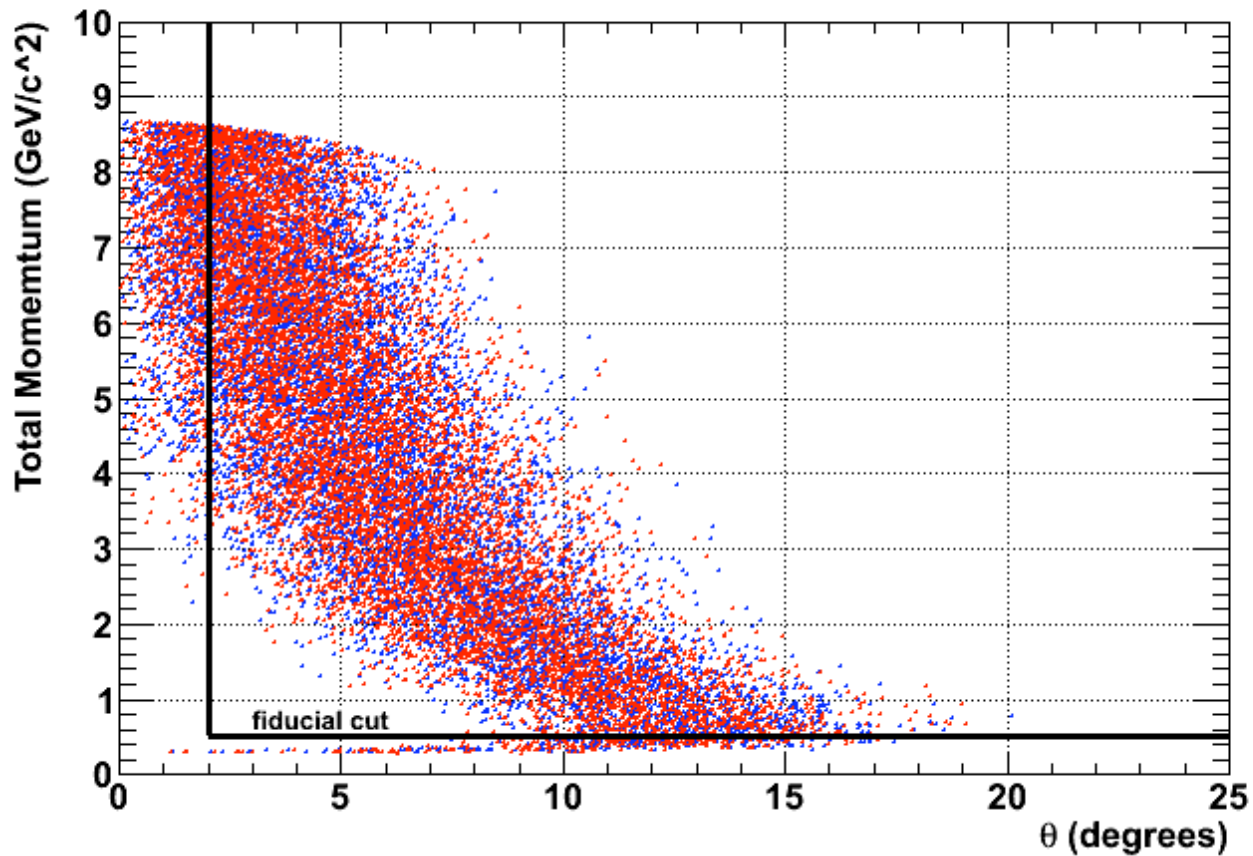


Invariant mass from thrown pions with and without fiducial cut on pions.

Black curve is fit to “no cut” histogram

$\pi^+ \pi^-$ momentum/angle distribution

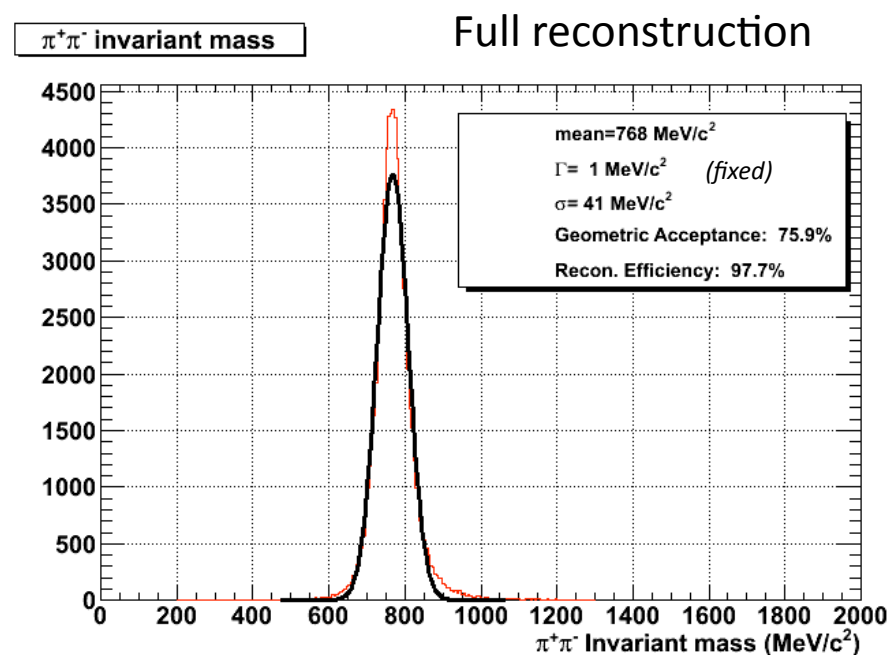
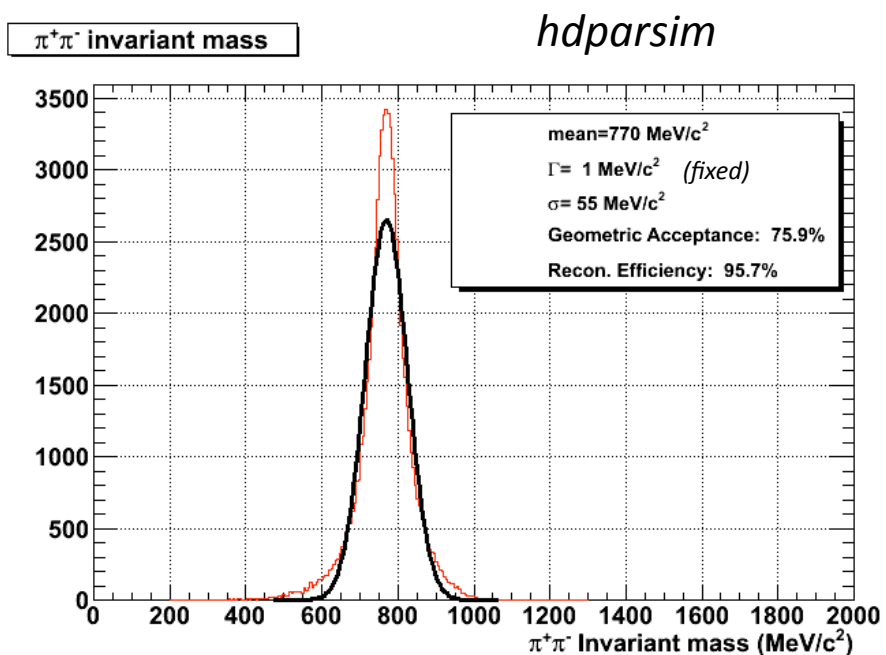
Phasespace occupancy of π^+/π^- from ρ decay



Phasespace occupied by pions from rho decays

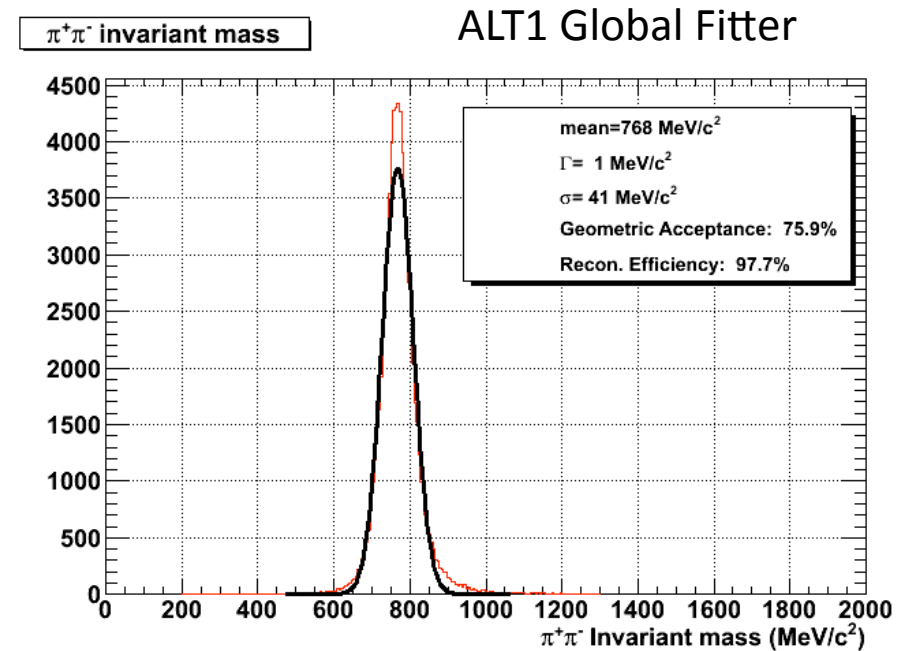
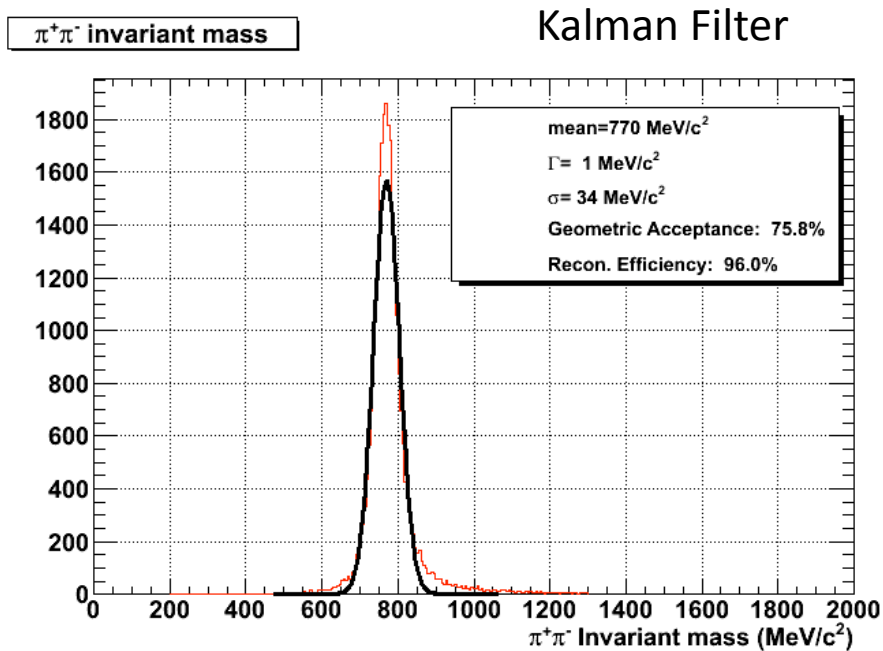
Red points are π^- and blue are π^+ .

Semi-parameteric M.C. vs. full reconstruction



The two seem comparable, but the full reconstruction has improvements made since the *hdparsim* resolution and efficiency tables were created.

Efficiency and resolution of reconstructed ρ



ALT1 fitter appears slightly more efficient while Kalman seems to give slightly better resolution.

Failed events in two fitters

ALT1	Kalman
146	146
	199
268	268
	612
	764
834	834
842	842
847	
	902
954	954

Event numbers of fiducial events where reconstruction failed from the first 1000 thrown events.

Many of the same event fail for both fitters.

Failed event: 146

Source: bad.hddm

View Controls

-X X+ ZOOM - +

-Y Y+ Transverse Coordinates

-Z Z+ Reset

x/y

r/phi

Event Controls

continuous

<-- Prev Next --> delay: 0.25

Info

Run: -----

Event: 146

Inspectors

Track Inspector

TOF Inspector

BCAL Inspector

FCAL Inspector

Quit

X
Z

70 cm

Y
X

20 cm

Track Draw Options

DTrackCandidate: <default>

DTrack: <default>

DParticle: <default>

DMCThrown

DMCTrajectoryPoint

Y
Z

70 cm

Y
X

30 cm

Hit Draw Options

CDC

CDC Drift Time

CDCTruth

FDC Wire

FDC Pseudo

FDC Intersection

FDCTruth

TOF

TOFTruth

FCAL

FCALTruth

BCAL

BCALTruth

Track Info

Thrown

trk:	type:	p:	theta:	phi:	z:
1	pi-	5.944	4.452	5.43	74.35
2	pi+	3.026	5.225	2.567	74.35
3	proton	0.2192	73.93	1.92	74.35
..
..

Reconstructed

trk:	type:	p:	theta:	phi:	z:	chisq/Ndof:	Ndof:	DParticle:
1	pi-	5.479	4.444	5.452	74.14	4.6	39	
..
..
..

Failed event: 268

Source: bad hddm

View Controls

-X X+ ZOOM - +
-Y Y+
-Z Z+ Reset

Transverse Coordinates
 x/y
 r/phi

Event Controls

continuous
 <-- Prev Next --> delay: 0.25

Info

Run: -----
 Event: 268

Inspectors

Track Inspector
 TOF Inspector
 BCAL Inspector
 FCAL Inspector

Quit

70 cm

20 cm

Track Draw Options

DTrackCandidate: <-default>
 DTrack: <-default>
 DParticle: <-default>
 DMCThrown
 DMCTrajectoryPoint

70 cm

30 cm

Hit Draw Options

CDC
 CDC Drift Time
 CDCTruth
 FDC Wire
 FDC Pseudo
 FDC Intersection
 FDCTruth
 TOF
 TOFTruth
 FCAL
 FCALTruth
 BCAL
 BCALTruth

Track Info

Thrown						Reconstructed								
trk:	type:	p:	theta:	phi:	z:	trk:	type:	p:	theta:	phi:	z:	chisq/Ndof:	Ndof:	DParticle:
1	pi-	7.602	4.279	2.184	57.27	1	pi+	0.1533	7.881	0.6787	80	34.89	17	
2	pi+	0.9935	16.64	1.612	57.27	2	pi+	1.017	16.64	1.622	57.1	0.0797	19	
3	proton	0.9448	60.36	5.137	57.27	3	pi+	0.9289	60.29	5.136	57.18	0.1575	22	
..
..

Failed event: 834

Source: bad.hddm

View Controls

-X X+ ZOOM - +
-Y Y+
-Z Z+ Reset

Transverse Coordinates
 x/y
 r/phi

Event Controls

continuous
 <-- Prev Next --> delay: 0.25

Info

Run: -----
 Event: 834

Inspectors

Track Inspector
 TOF Inspector
 BCAL Inspector
 FCAL Inspector

Quit

70 cm

20 cm

Track Draw Options

DTrackCandidate: <default>
 DTrack: <default>
 DParticle: <default>
 DMCThrown
 DMCTrajectoryPoint

70 cm

30 cm

Hit Draw Options

CDC
 CDC Drift Time
 CDCTruth
 FDC Wire
 FDC Pseudo
 FDC Intersection
 FDCTruth
 TOF
 TOFTruth
 FCAL
 FCALTruth
 BCAL
 BCALTruth

Track Info

Thrown						Reconstructed								
trk:	type:	p:	theta:	phi:	z:	trk:	type:	p:	theta:	phi:	z:	chisq/Ndof:	Ndof:	DParticle:
1	pi-	5.761	5.894	2.827	64.07	1	pi+	3.276	4.16	5.382	64.68	2.472	25	
2	pi+	3.133	4.131	5.381	64.07	2	pi+	0.3798	11.53	1.768	50	35.12	16	
3	proton	0.4466	71.15	6.27	64.07	3	pi+	0.4275	69.77	6.249	63.69	0.1216	22	
..	
..	

Failed event: 954

Source: bad hddm

View Controls

-X X+ ZOOM - +
-Y Y+
-Z Z+ Reset

Transverse Coordinates
 x/y
 r/phi

Event Controls

continuous
<< Prev Next >> delay: 0.25

Info

Run: -----
Event: 954

Inspectors

Track Inspector
TOF Inspector
BCAL Inspector
FCAL Inspector

Quit

70 cm

20 cm

Track Draw Options

DTrackCandidate: <default>
 DTrack: <default>
 DParticle: <default>
 DMCThrown
 DMCTrajectoryPoint

70 cm

30 cm

Hit Draw Options

CDC
 CDC Drift Time
 CDCTruth
 FDC Wire
 FDC Pseudo
 FDC Intersection
 FDCTruth
 TOF
 TOFTruth
 FCAL
 FCALTruth
 BCAL
 BCALTruth

Track Info

Thrown					
trk:	type:	p:	theta:	phi:	z:
1	pi-	3.103	5.144	2.381	50.5
2	pi+	5.871	4.468	5.728	50.5
3	proton	0.2017	73.7	2.884	50.5
..
..

Reconstructed							
trk:	type:	p:	theta:	phi:	z:	chisq/Ndof:	Ndof:
1	pi-	3.071	5.152	2.358	51.77	12.55	35
..
..
..

ALT1

Evt: 847
ALT1 failed
Kalman succeeded

Apparently good
candidate for both
tracks

Source: bad.hddm

View Controls: -X, X+, -Y, Y+, -Z, Z+, ZOOM (-, +), Reset, Transverse Coordinates (x/y, r/phi)

Event Controls: <-- Prev, Next -->, delay: 0.25, continuous

Info: Run: -----, Event: 842

Inspectors: Track Inspector, TOF Inspector, BCAL Inspector, FCAL Inspector, Quit

Track Draw Options: DTrackCandidate: DCpseudo, DTrack: <default>, DParticle: <default>, DMCThrown, DMCTrajectoryPoint

Hit Draw Options: CDC, CDC Drift Time, CDCTruth, FDC Wire, FDC Pseudo, FDC Intersection, FDCTruth, TOF, TOFTruth, FCAL, FCALTruth, BCAL, BCALTruth

Track Info

Thrown						
trk	type	p	theta	phi	z	
1	pi-	2.214	7.954	.211	67.39	
2	pi+	6.748	2.984	4.076	67.39	
3	proton	0.2461	73.94	.965	67.39	

Reconstructed							
trk	type	p	theta	phi	z	chisq/Ndof	Ndof
1	pi+	6.287	2.992	4.068	68.4	.51	41
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----

Kalman

Evt: 847
 ALT1 failed
 Kalman succeeded

Apparently good
 candidate for both
 tracks

Source: bad.hddm

View Controls

-X X+ ZOOM - +
 -Y Y+
 -Z Z+ Reset

Transverse Coordinates
 x/y
 r/phi

Event Controls

continuous
 Prev Next --> delay: 0.25

Info

Run: -----
 Event: 847

Inspectors

Track Inspector
 TOF Inspector
 BCAL Inspector
 FCAL Inspector

Quit

Track Draw Options

DTrackCandidate: DCpseudo
 DTrack: <default>
 DParticle: Kalman
 DMCThrown
 DMCTrajectoryPoint

Hit Draw Options

CDC
 CDC Drift Time
 CDCTruth
 FDC Wire
 FDC Pseudo
 FDC Intersection
 FDCTruth
 TOF
 TOFTruth
 FCAL
 FCALTruth
 BCAL
 BCALTruth

Track Info

Thrown					
trk	type	p	theta	phi	z
1	pi-	1.7197	11.2	.906	68.49
2	pi+	8.24	2.396	4.298	68.49
3	proton	0.2205	73.9	1.32	68.49

Reconstructed							
trk	type	p	theta	phi	z	chisq/Ndof	Ndof
1	proton-	1.7356	10.53	0.891	65.75	3.247	29
2	pi+	5.611	2.381	4.232	67.49	7.786	35

Summary

- Reconstruction efficiency for ρ is consistent with expectation from single track efficiencies
- ALT1 and Kalman filter appear give roughly the same performance in efficiency and resolution.
- Inefficiencies are mostly coming from poorly defined candidates
- Next steps:
 - Look at protons from same set of events
 - Turn on E.M. background