Σ(1385) ANALYSIS STATUS

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INFN and University Trieste

Resonances meeting – CERN – 04/03/2011

Outlook

- How is the signal extracted
- Comparison of the extracted signal with the MC-truth (for simulated data)
- Results for real data
- Pt spectrum

Side-band fit of the invariant mass

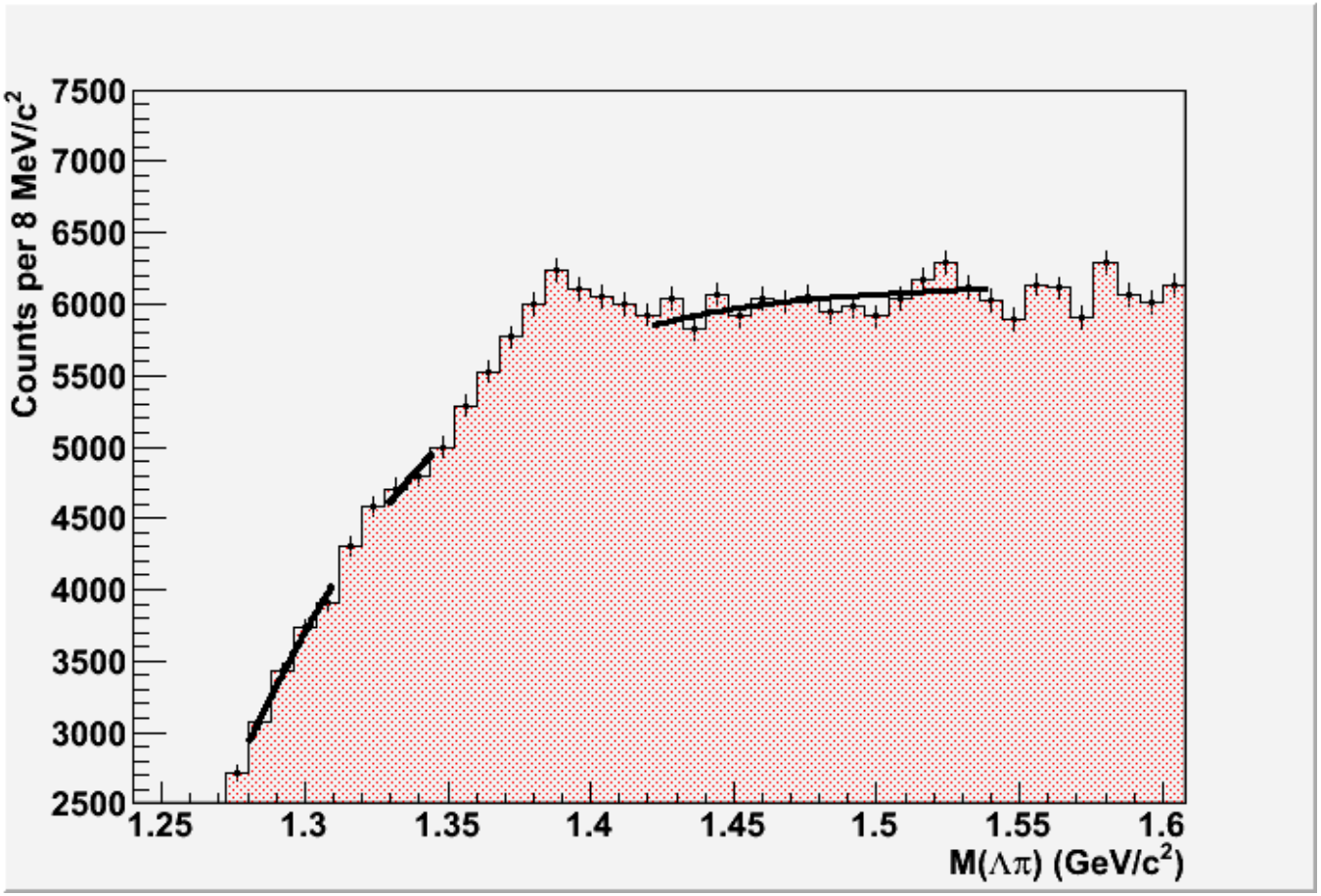
Simulated data from period LHC10d1/d4

$1.6 < p_t < 1.8$ GeV/c

STEP 1/4

The invariant mass is fitted side-band with a Laurent expansion

Note the exclusion regions around the Ξ(1320) and Σ(1385) peaks



Combined BKG+SIGNAL fit

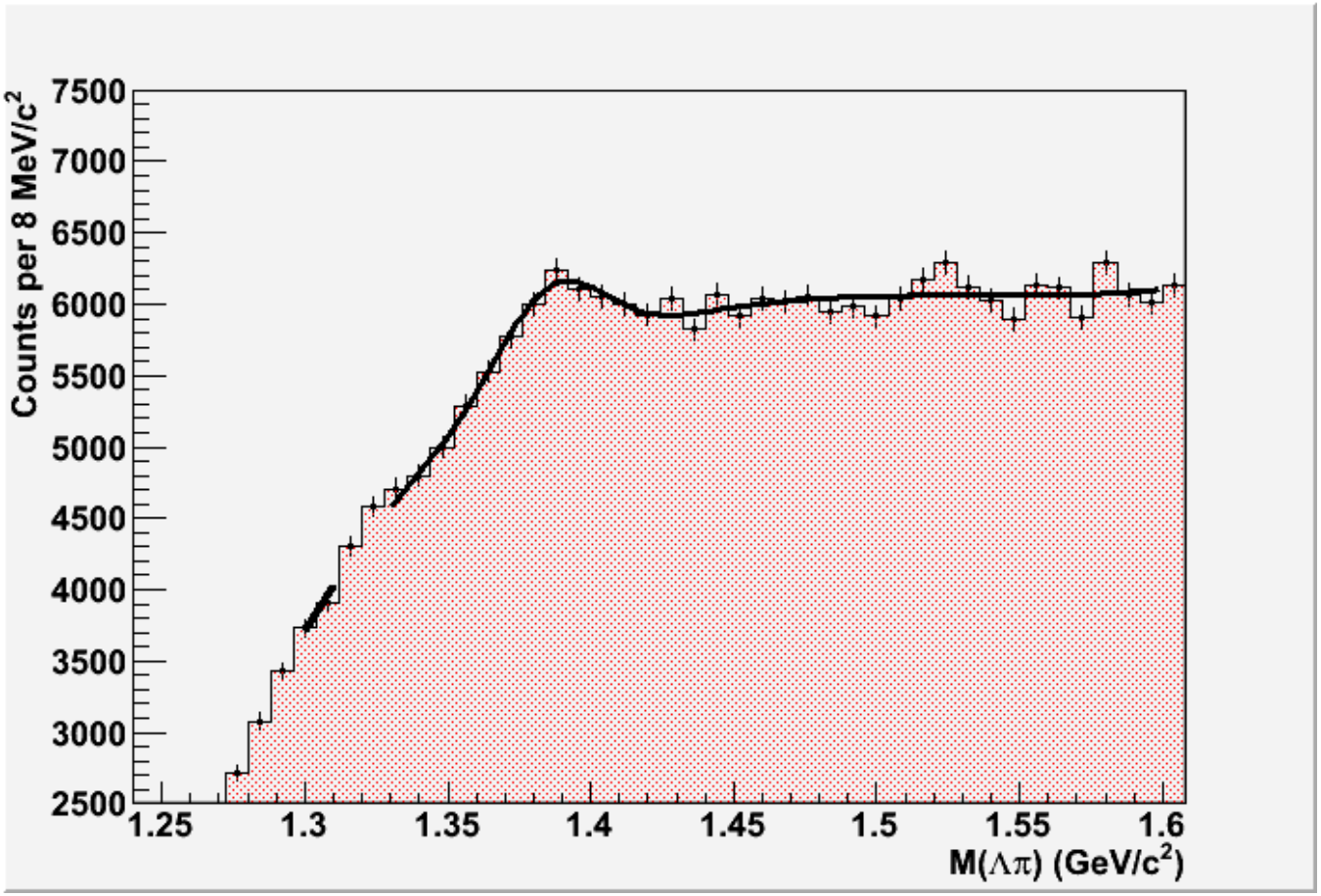
Simulated data from period LHC10d1/d4

$1.6 < p_t < 1.8$ GeV/c

STEP 2/4

The side-band parameters are used as starting points for a combined BKG+SIGNAL fit

Best results with a gaussian function!



Defining the background

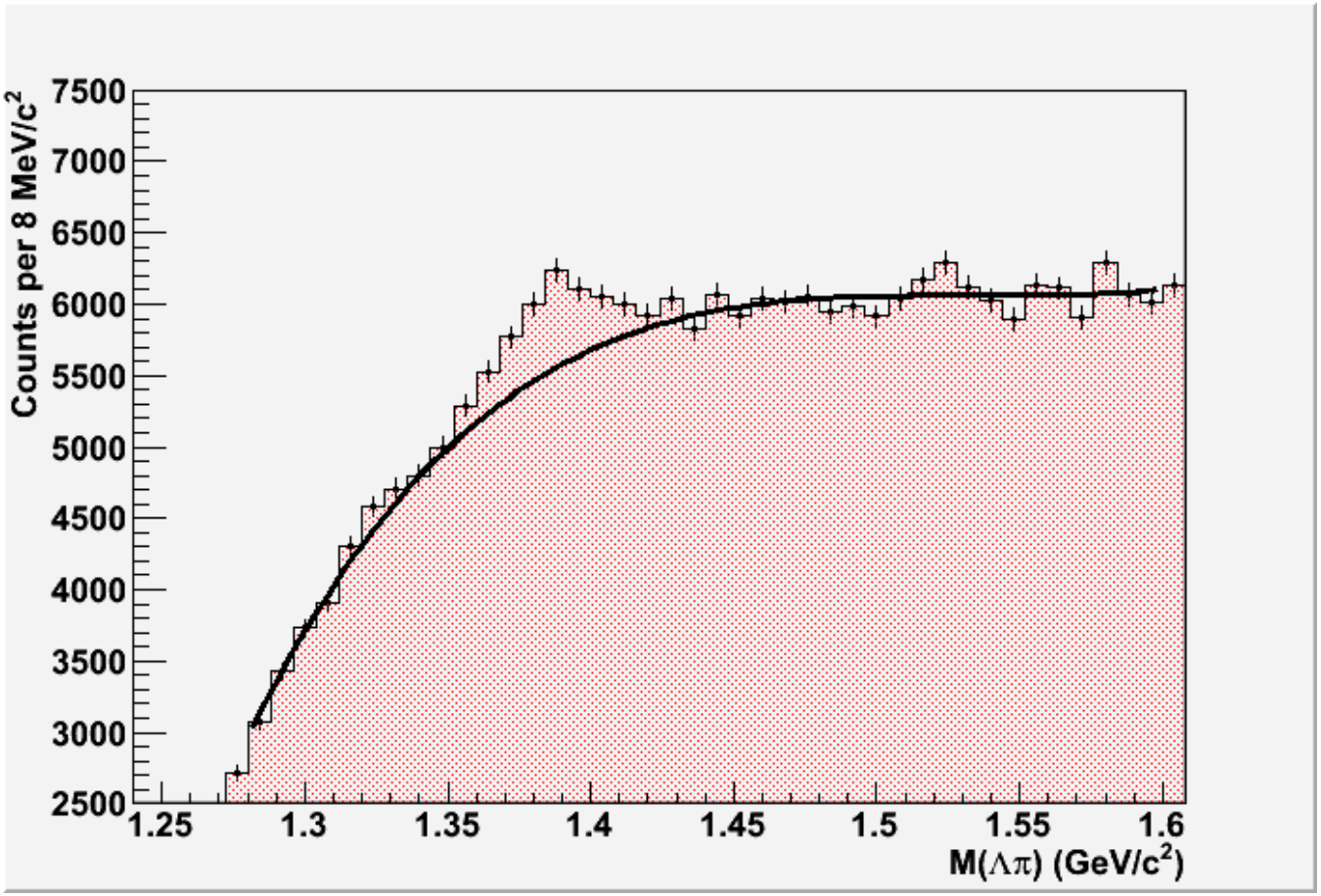
Simulated data from period LHC10d1/d4

$1.6 < p_t < 1.8$ GeV/c

STEP 3/4

The BKG part of the combined fit is interpolate to describe the combinatorial background

The BKG function is subtracted to extract the signal



Getting the signal

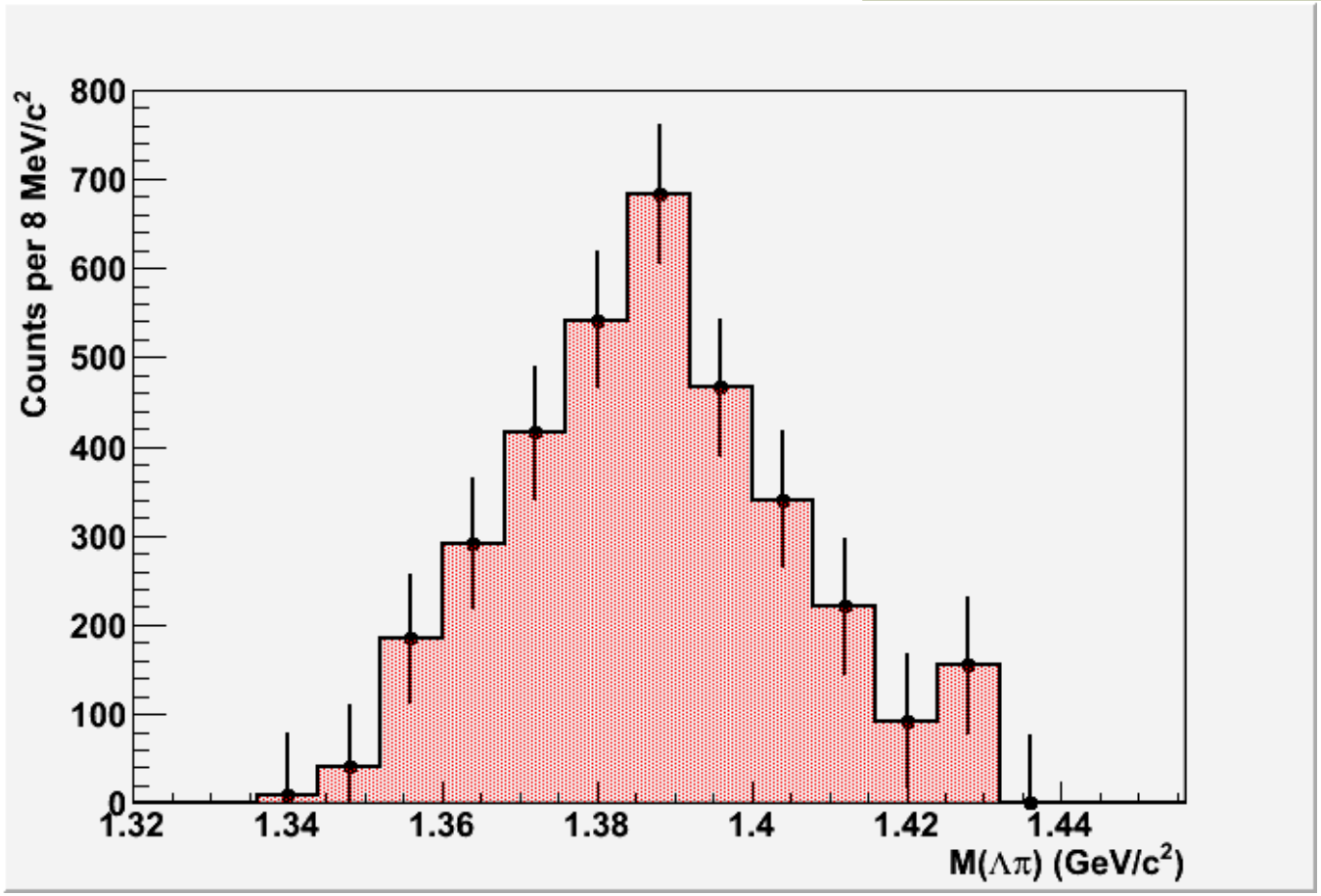
Simulated data from period LHC10d1/d4

$1.6 < p_t < 1.8$ GeV/c

STEP 4/4

Statistical errors are propagated through the extraction procedure

The signal histogram is used to obtain mean, rms and integral

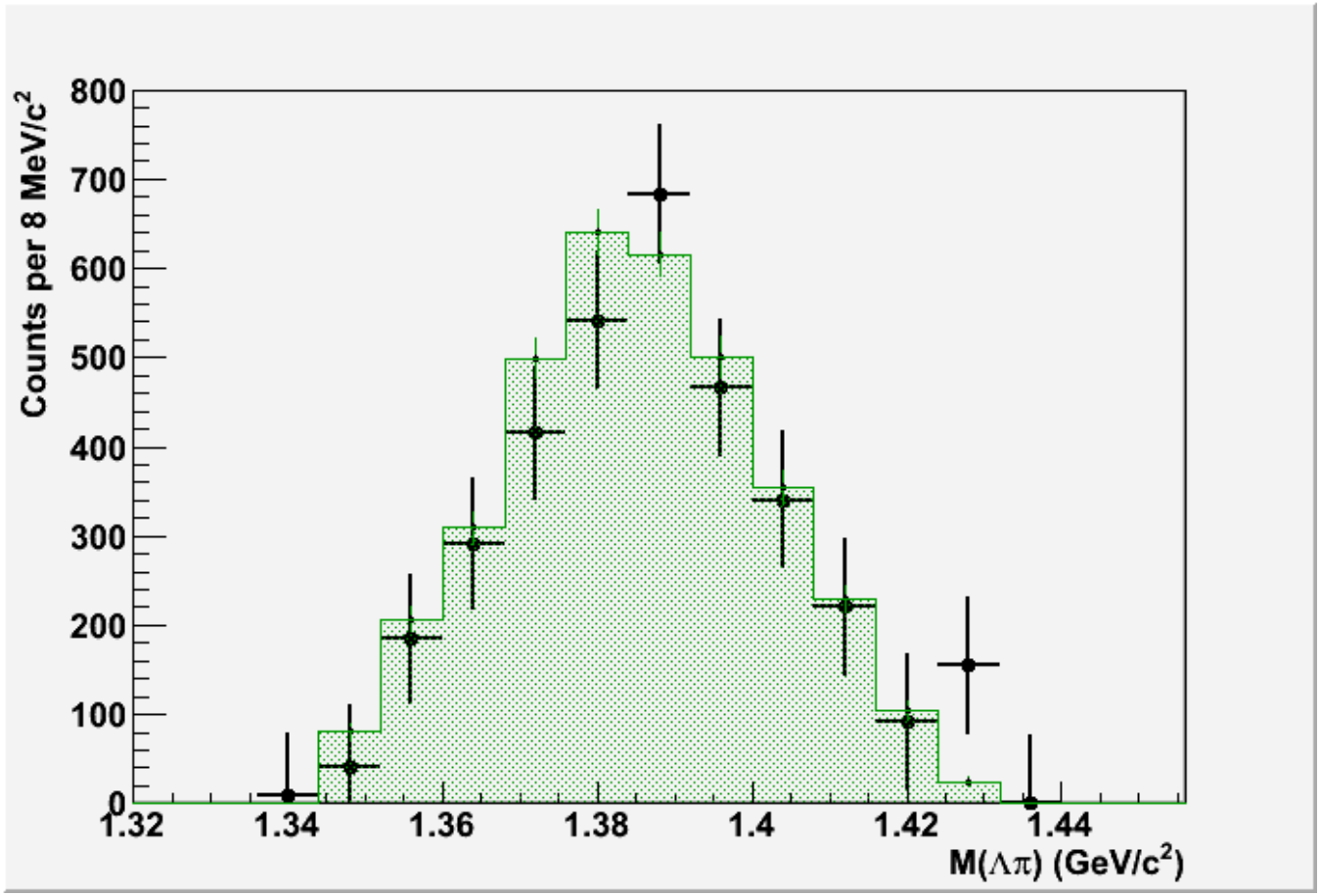


Comparing with the MC-true (1/2)

Simulated data from period LHC10d1/d4

$1.6 < p_t < 1.8$ GeV/c

The extracted signal is compared with the MC-true peak (in green)



Comparing with the MC-true (2/2)

Simulated data from period LHC10d1/d4

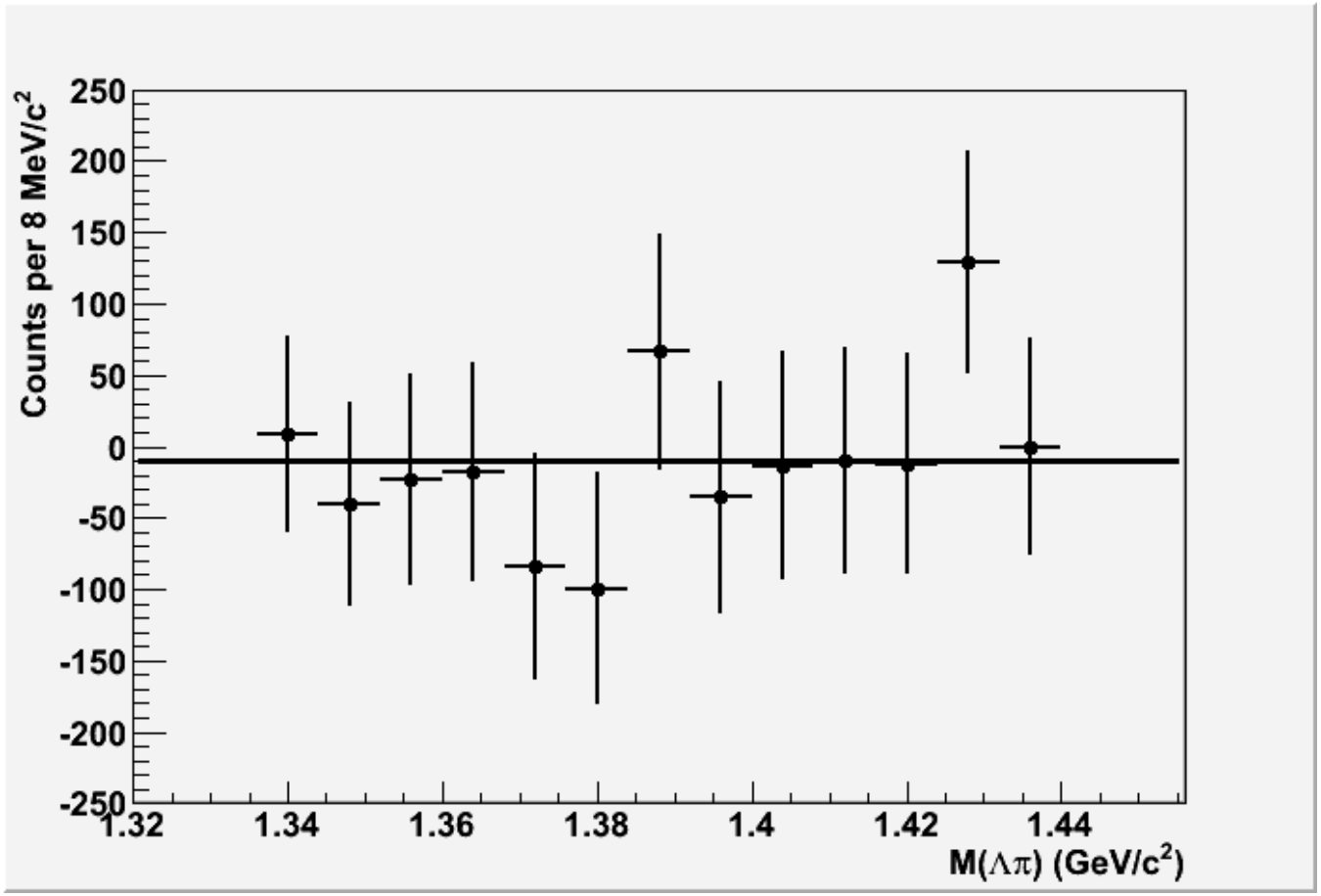
$1.6 < p_t < 1.8$ GeV/c

Difference between the extracted signal and the MC-true peak

Pol0 fit:

p0 = 10.±21.

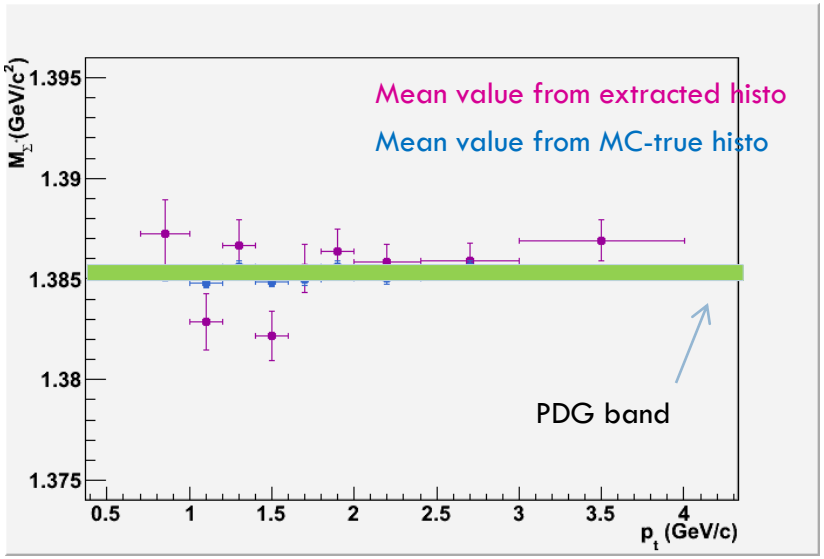
X^2/NDF=6.5/7

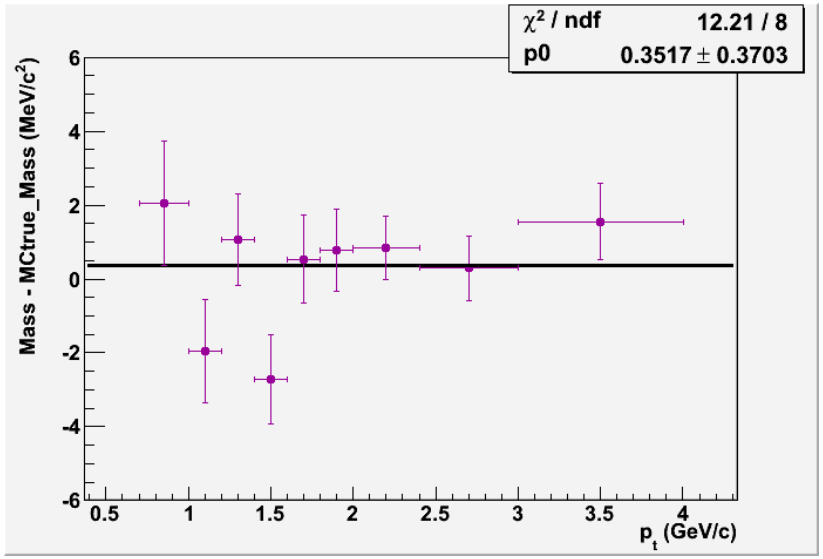


Mass

Simulated data from period LHC10d1/d4

Mass of the Σ* vs pt

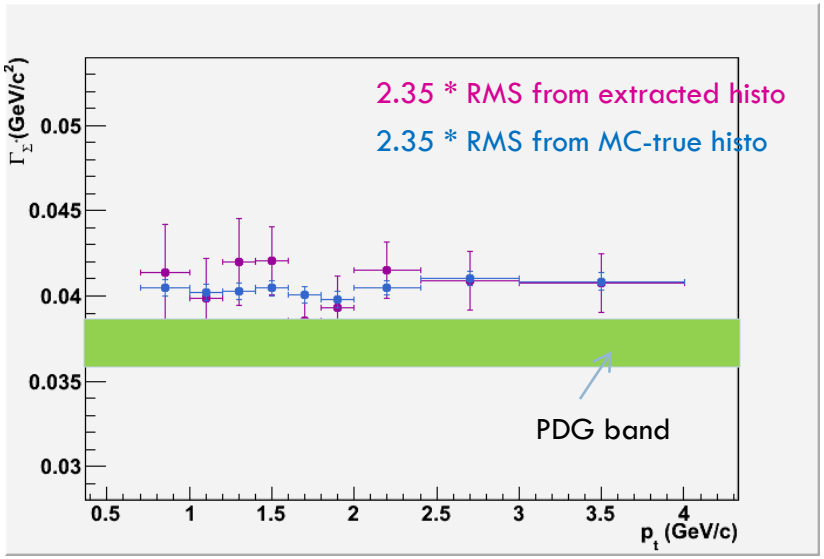


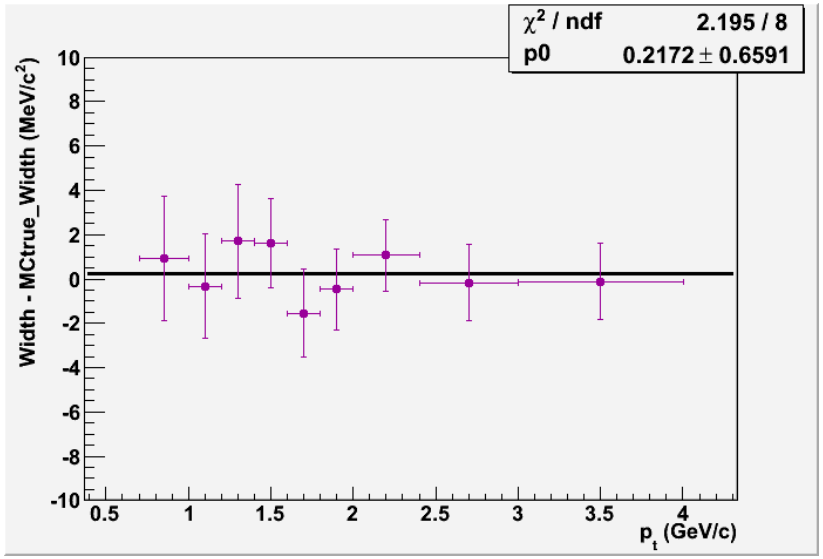


Width

Simulated data from period LHC10d1/d4

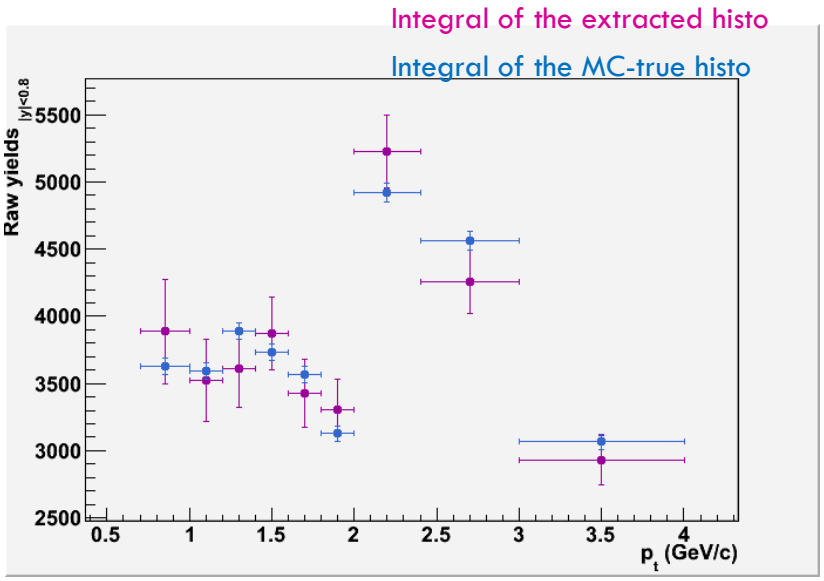
Width of the Σ* vs pt

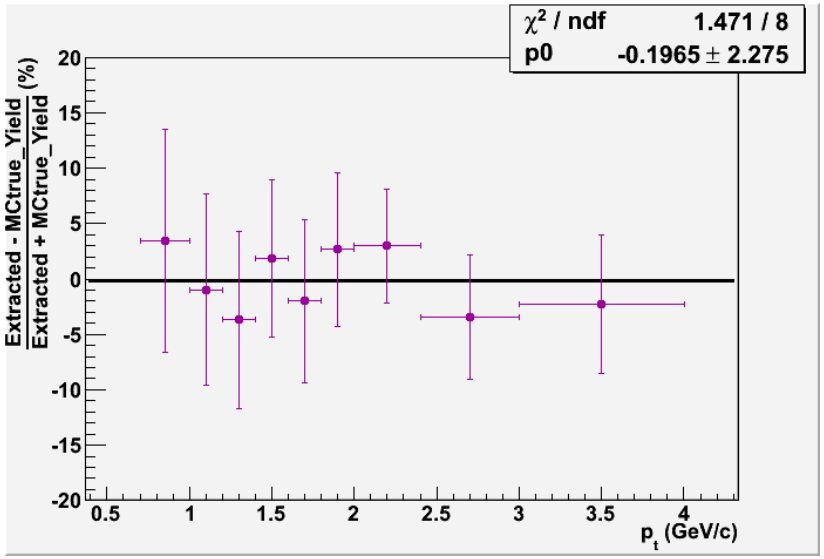




Yields

Simulated data from period LHC10d1/d4





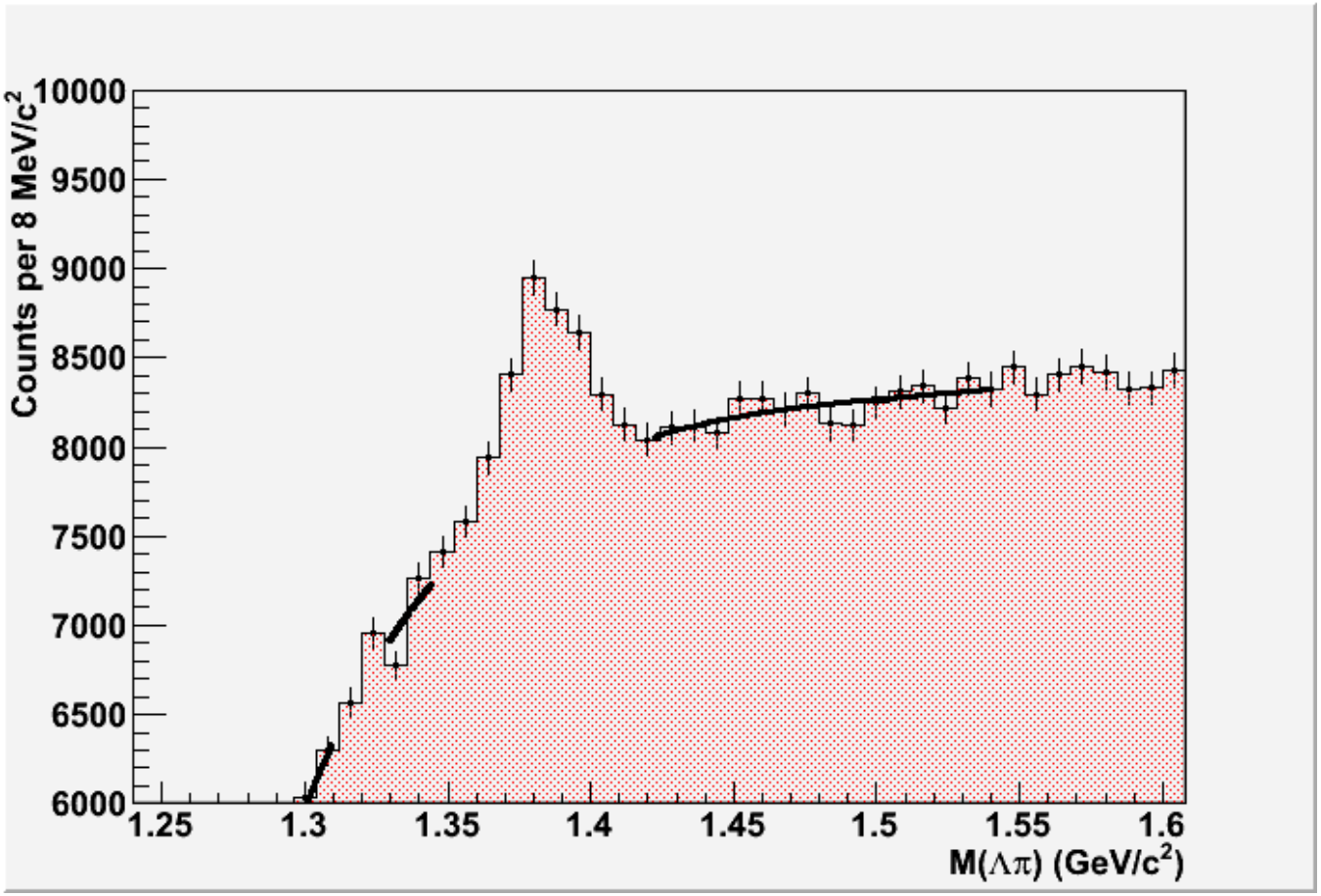
Side-band fit of the invariant mass

Real data from period LHC10b/c

$2.4 < p_t < 3.0$ GeV/c

The invariant mass is fitted side-band with a Laurent expansion

Note the exclusion regions around the Ξ(1320) and Σ(1385) peaks



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Real data from period LHC10b/c

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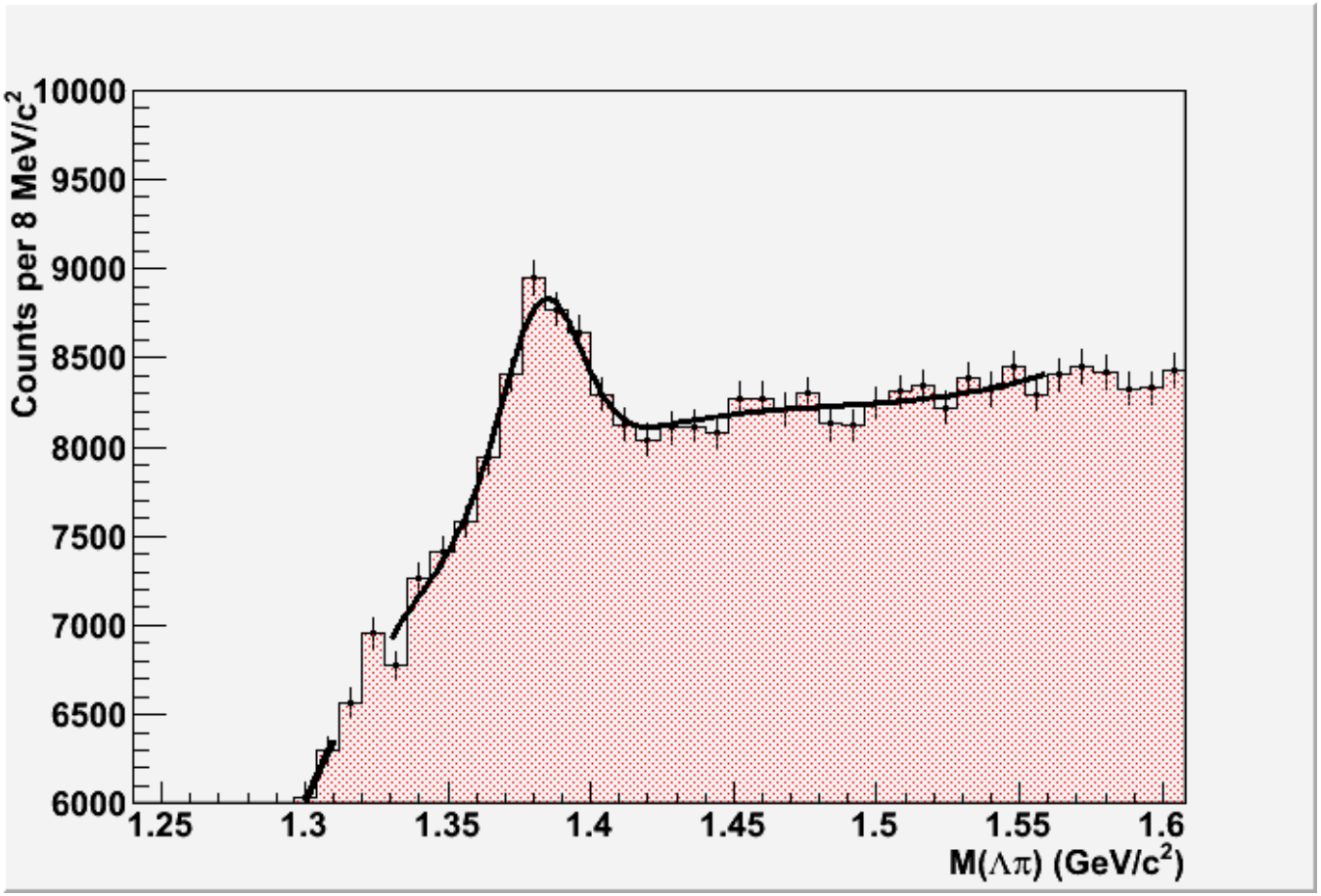
Best results with a gaussian function!



Defining the background

Real data from period LHC10b/c

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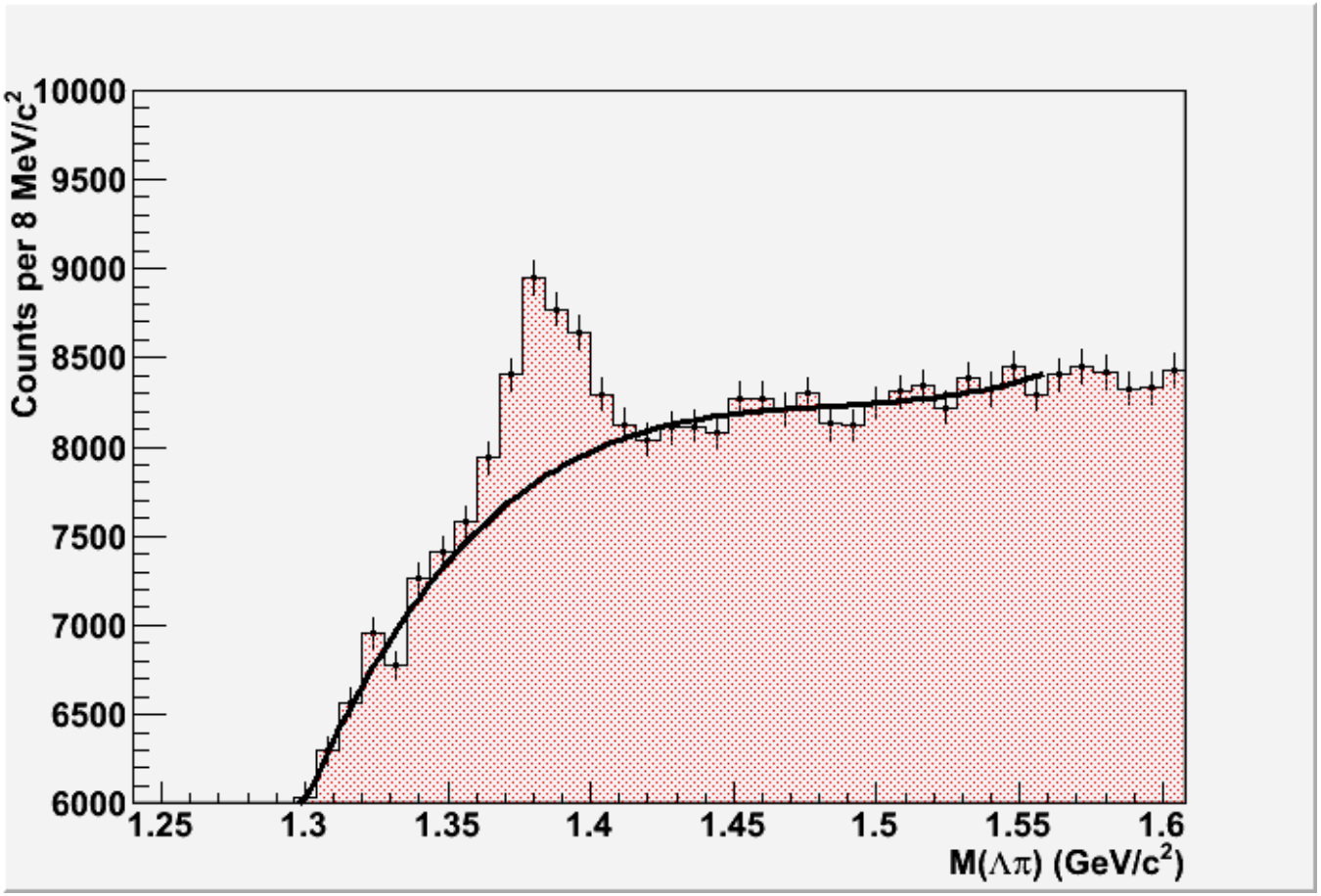

Getting the signal

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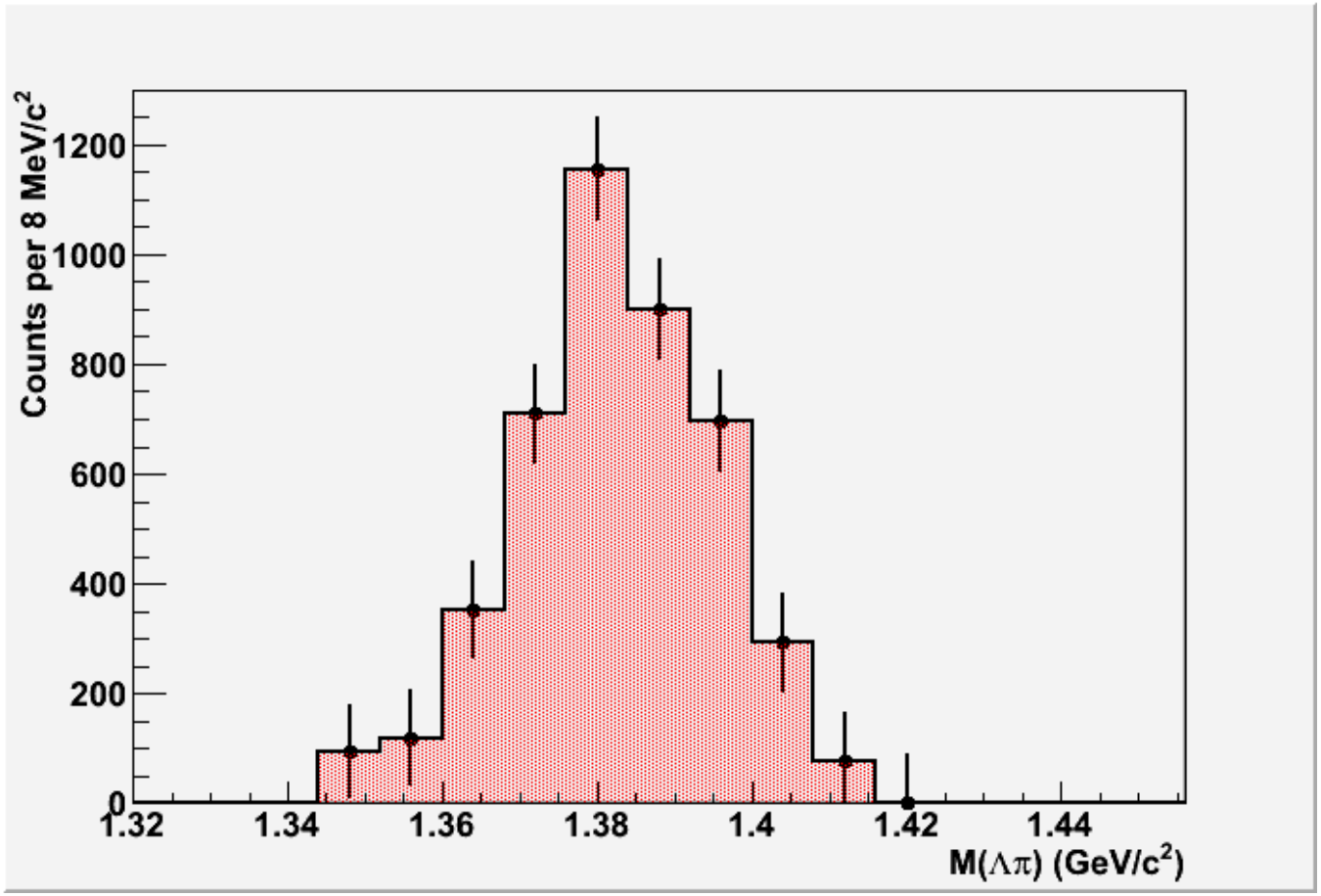
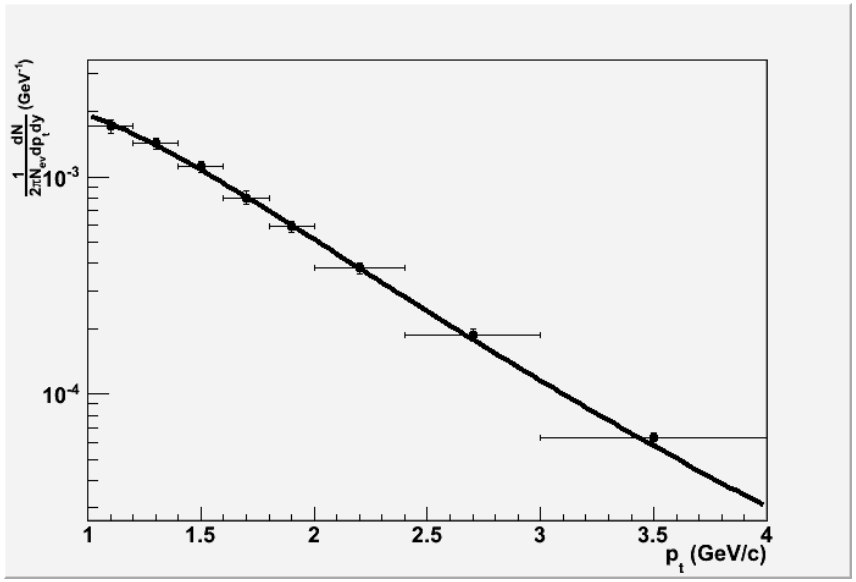
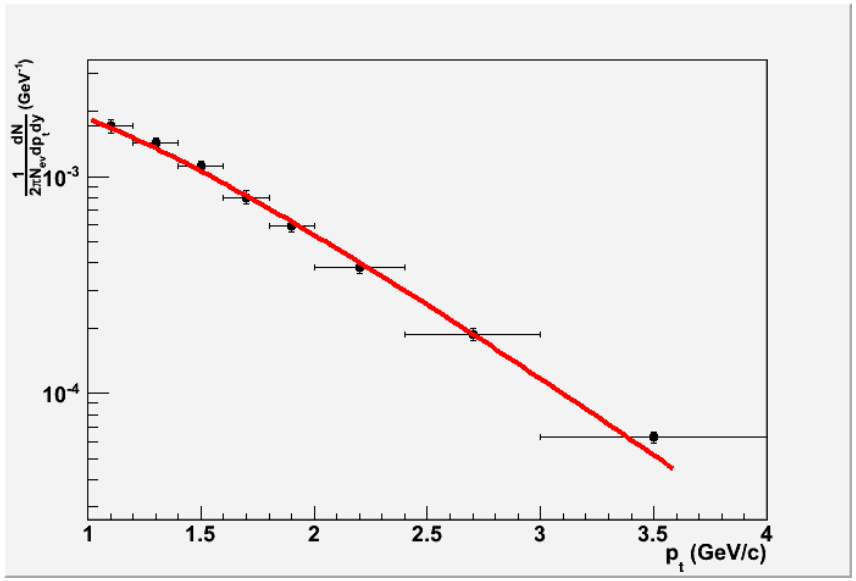


Pt spectrum with fits

Levy-Tsallis
n = (8.1 ± 1.5)
T = (276 ± 28) MeV
Chi2/NDF = 0.7/5

Exp
T = (517 ± 8) MeV
Chi2/NDF = 5.5/6





Conclusions

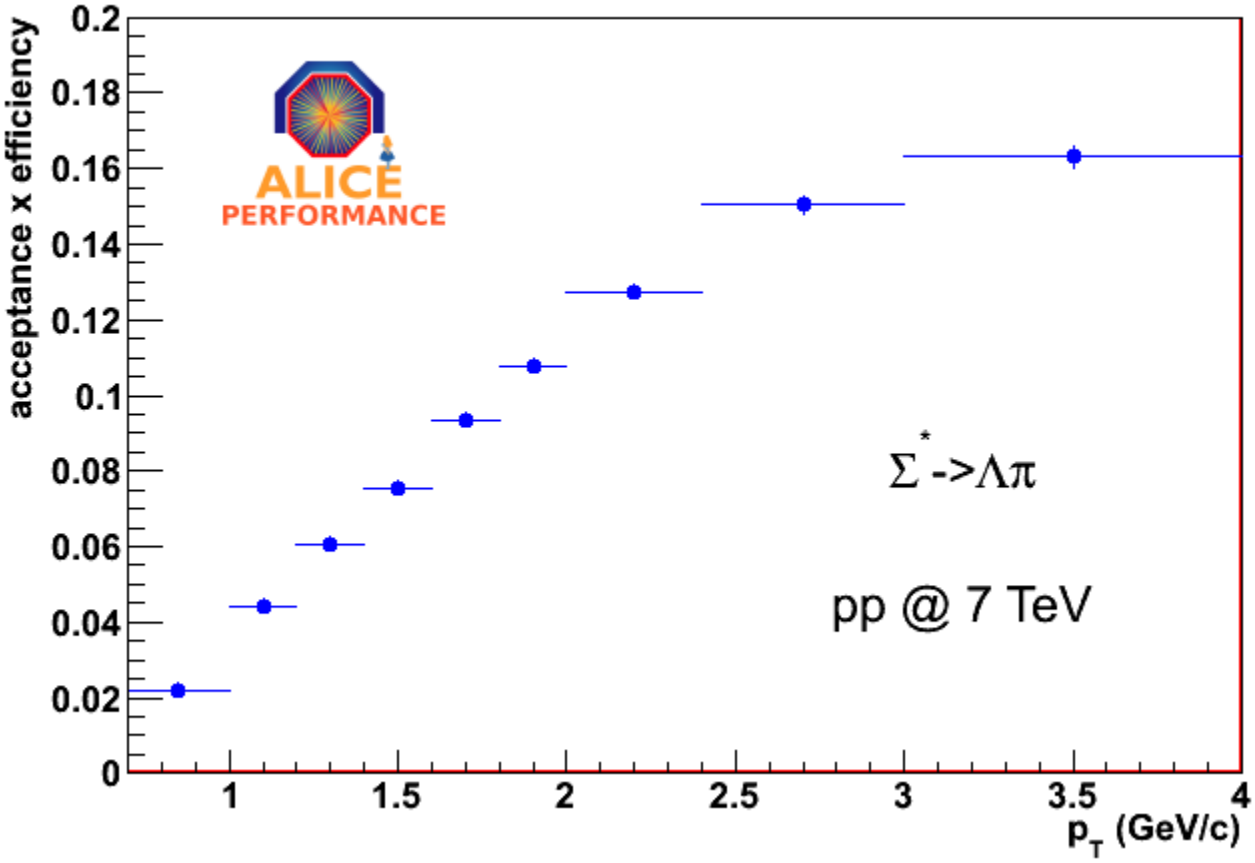
- Extraction procedure well defined
- Statistical errors dominates!
- For simulated data, the MC-true signal is within the statistical errors of the extracted signal
- Plan to analyze LHC10d period to increase statistics for real data

Backup slides

Event and track selection

Cut	Value
AliPhysicsSelection	
Reject kink daughters	
ClusterRequirementITS	SPD + Any SDD/SSD
MaxChi2PerTPCcluster	4
Z vertex	$-10 < z < 10$
Λ daughters TPC clusters	> 70
Bachelor TPC clusters	> 70
Chi2/nTPCclusters	< 4
Λ mass	$1.110\ \mathrm{GeV}/c^2 < m < 1.122\ \mathrm{GeV}/c^2$
Λ cos of point. Angle	> 0.99
Λ daughters DCA	< 0.5 cm
Primary Vertex - Λ DCA	< 0.3 cm
Primary Vertex - Bachelor DCA	< 0.05 cm

Efficiency


acceptance x efficiency
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1
1.5
2
2.5
3
3.5
4
p_T (GeV/c)
ALICE
PERFORMANCE
$\Sigma^* \rightarrow \Lambda\pi$
pp @ 7 TeV

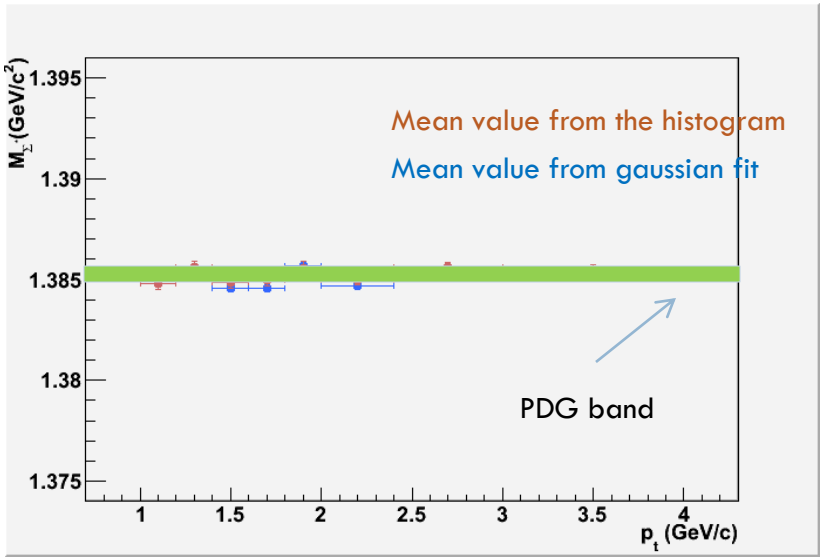
LHC10d1/d4 sim data

MC-true signal mass and width

All points from MC-true signal. No signal extraction was performed!

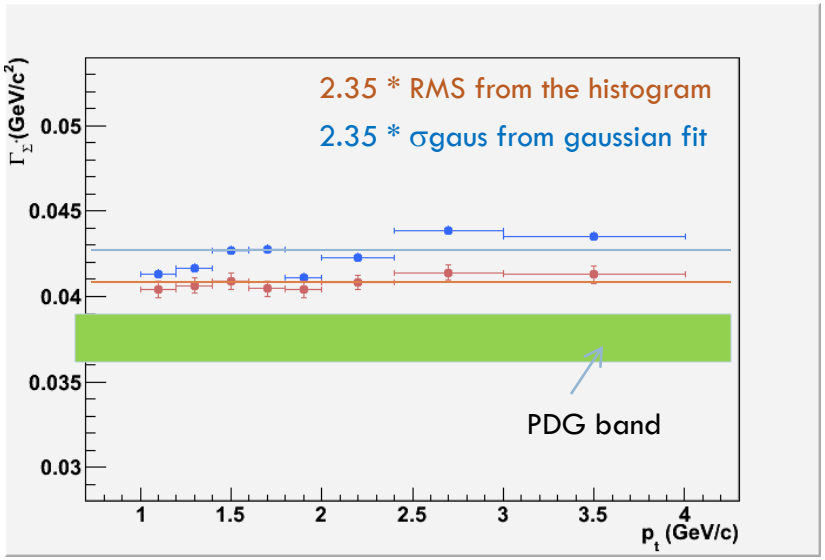
Statistical errors only

Mass of the Σ* vs pt



All points are within the statistical errors of the PDG value

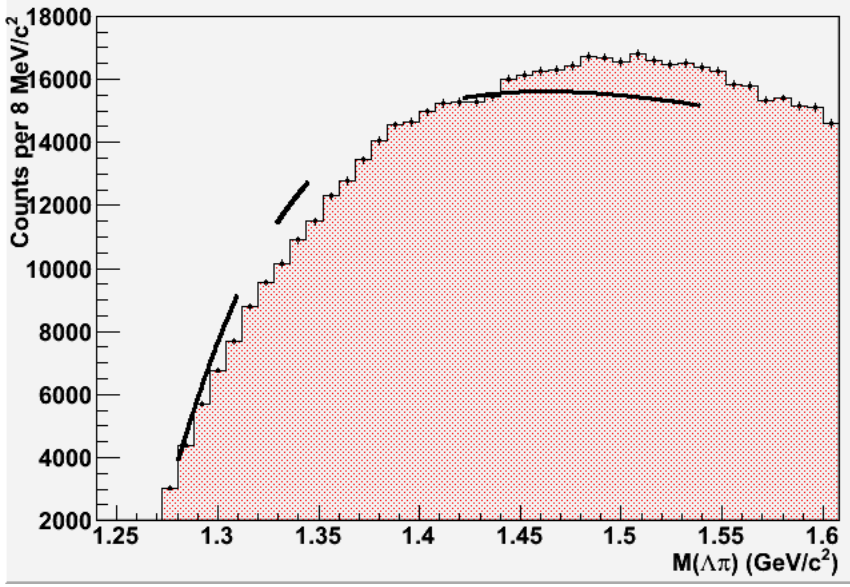
Width of the Σ* vs pt

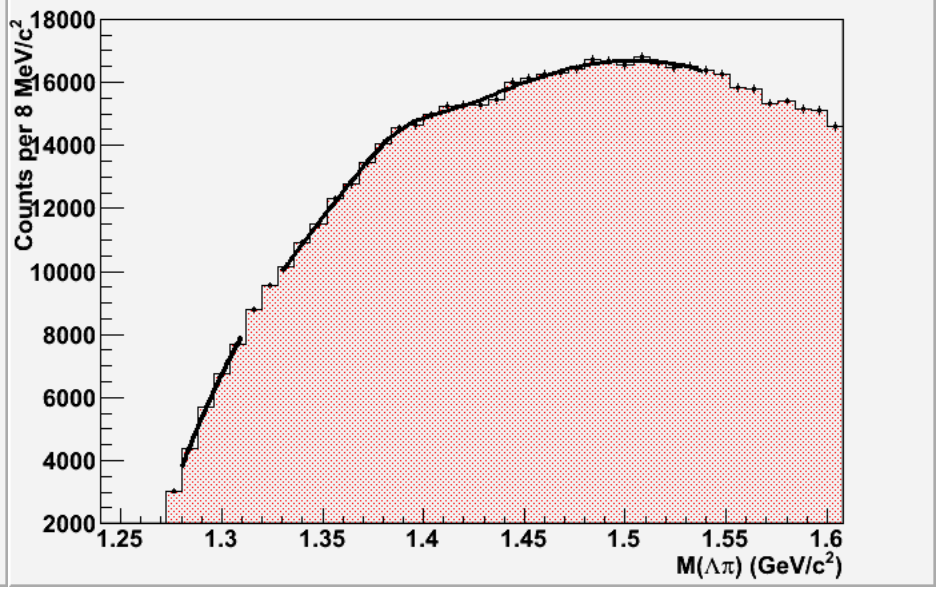


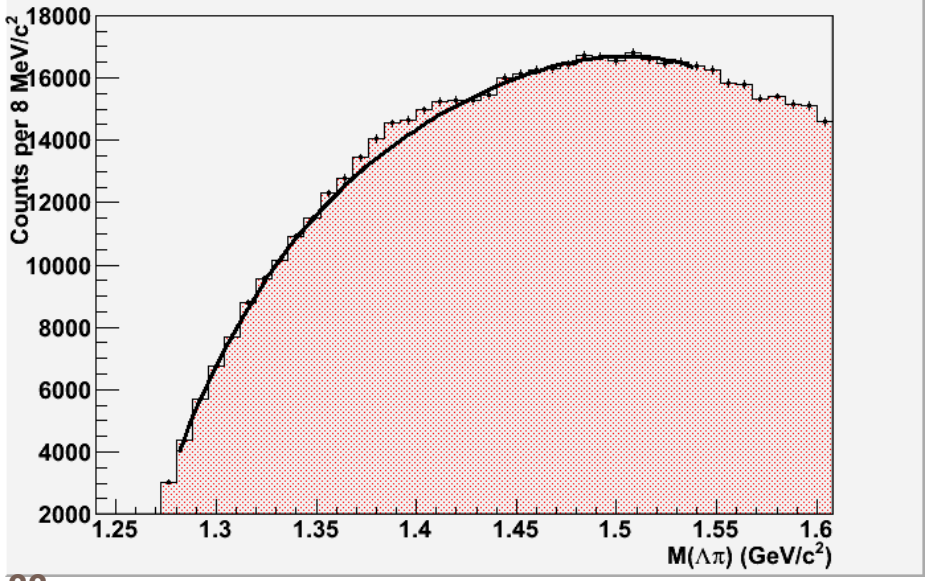
On average, three (five) MeV/c higher than the PDG value -> Resolution effect

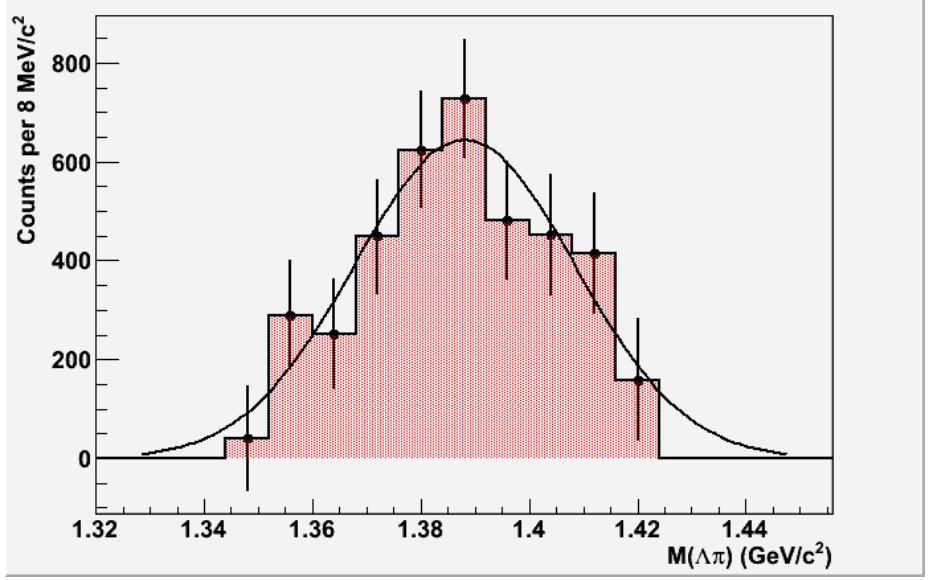
Sim data LHC10d1/d4

$0.7 < p_t < 1.0$ GeV/c



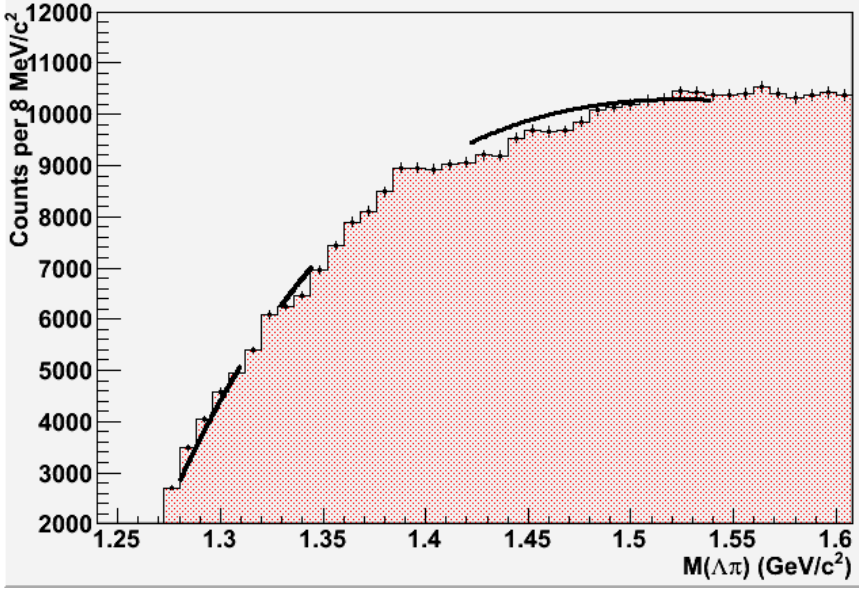


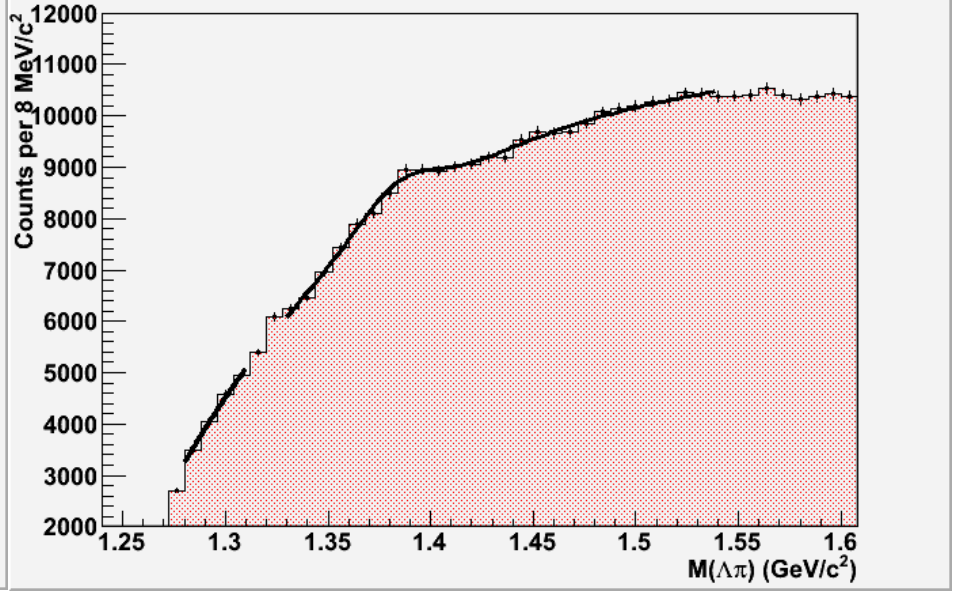


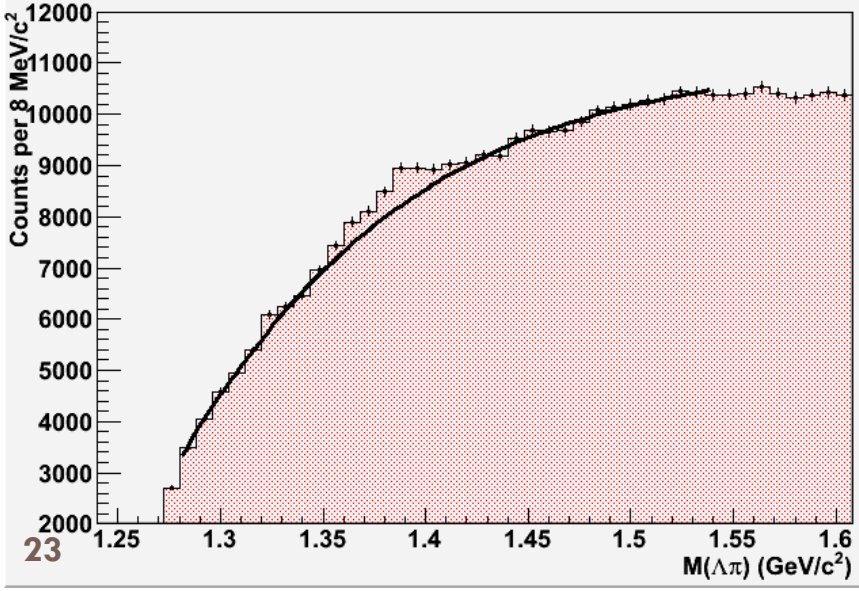


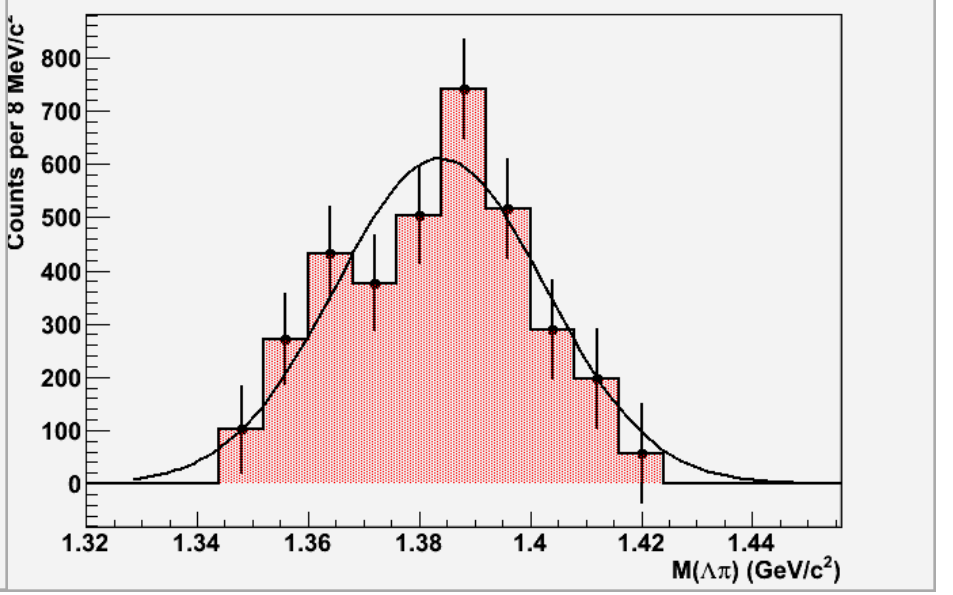
Sim data LHC10d1/d4

$1.0 < p_t < 1.2$ GeV/c



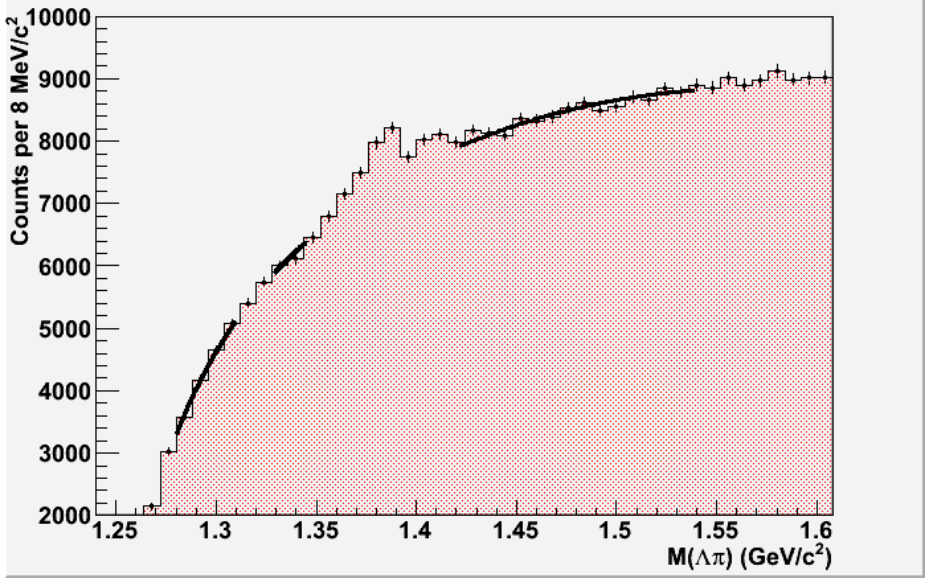


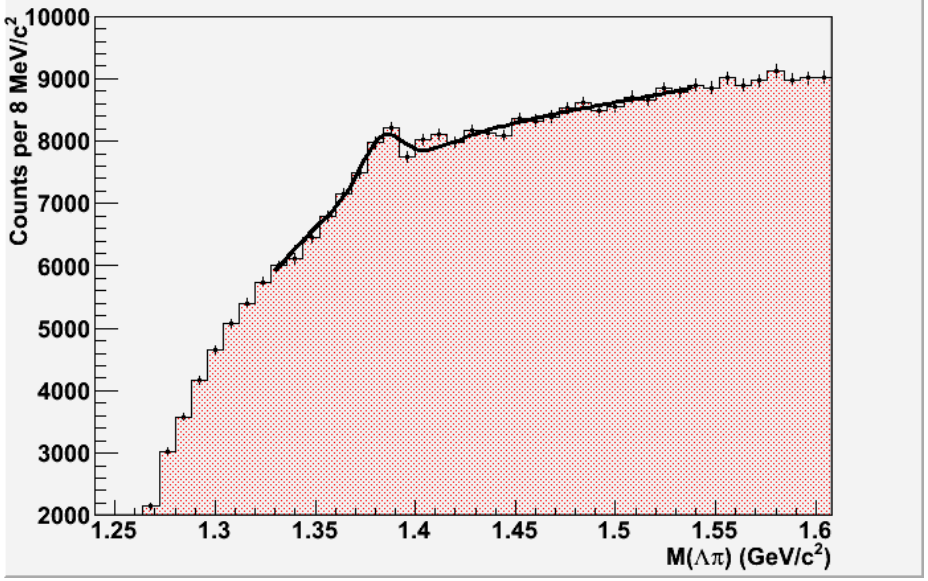


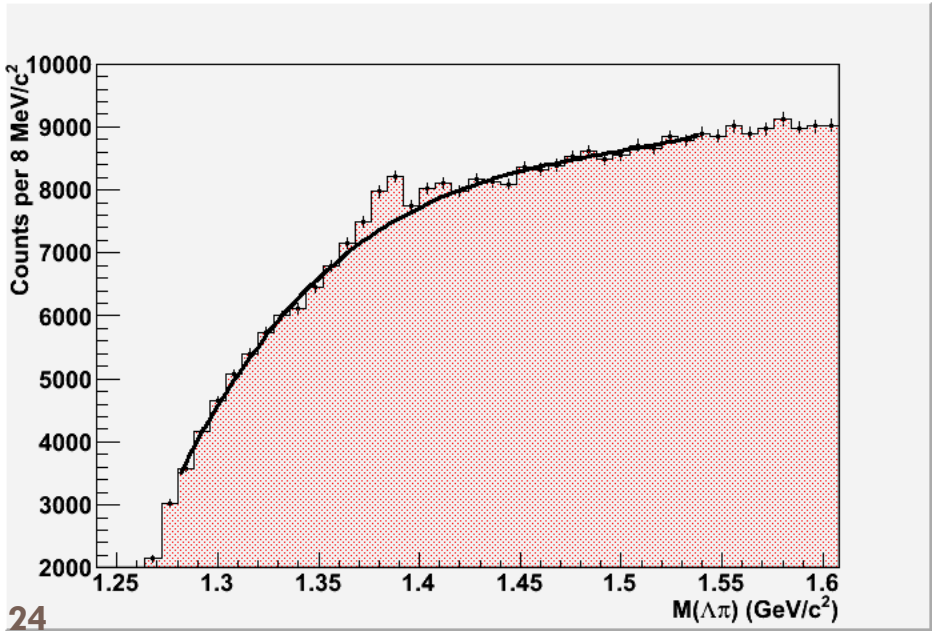


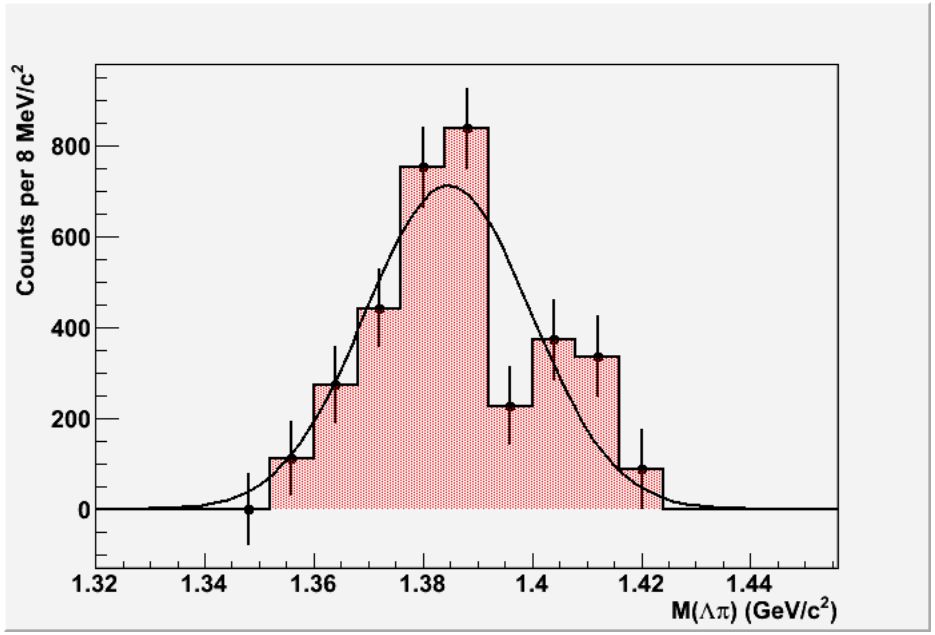
Sim data LHC10d1/d4

$1.2 < p_t < 1.4$ GeV/c



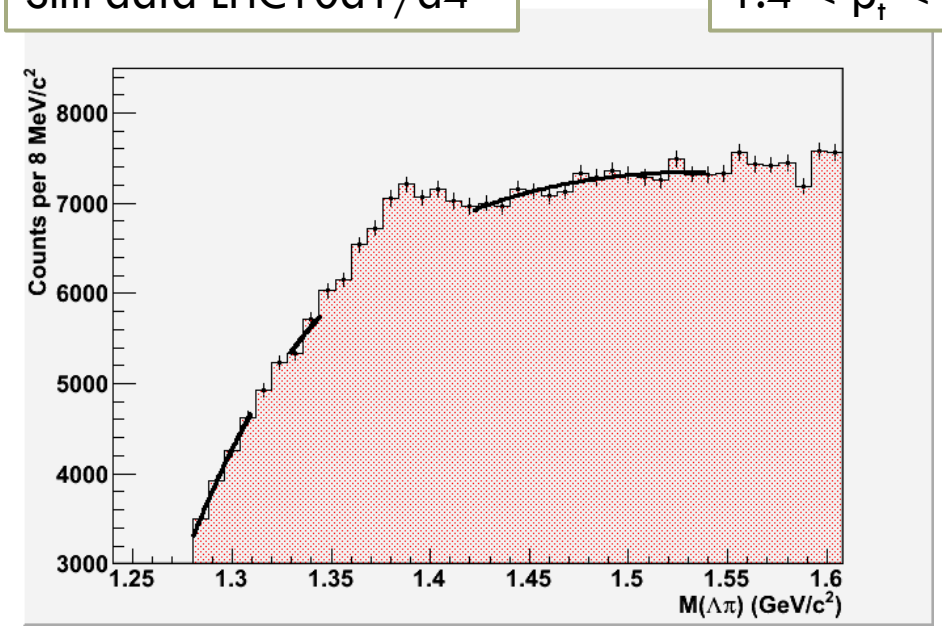


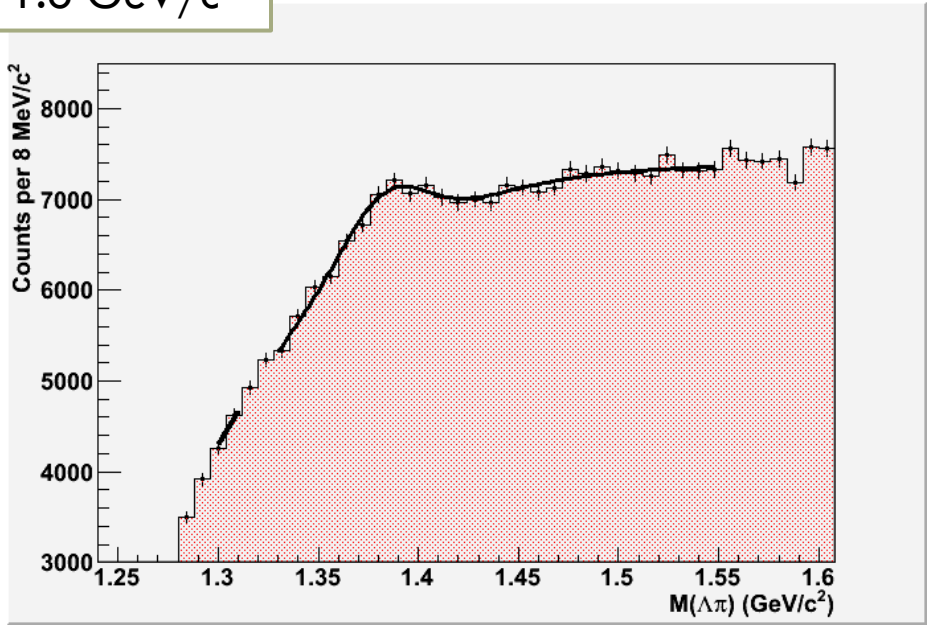


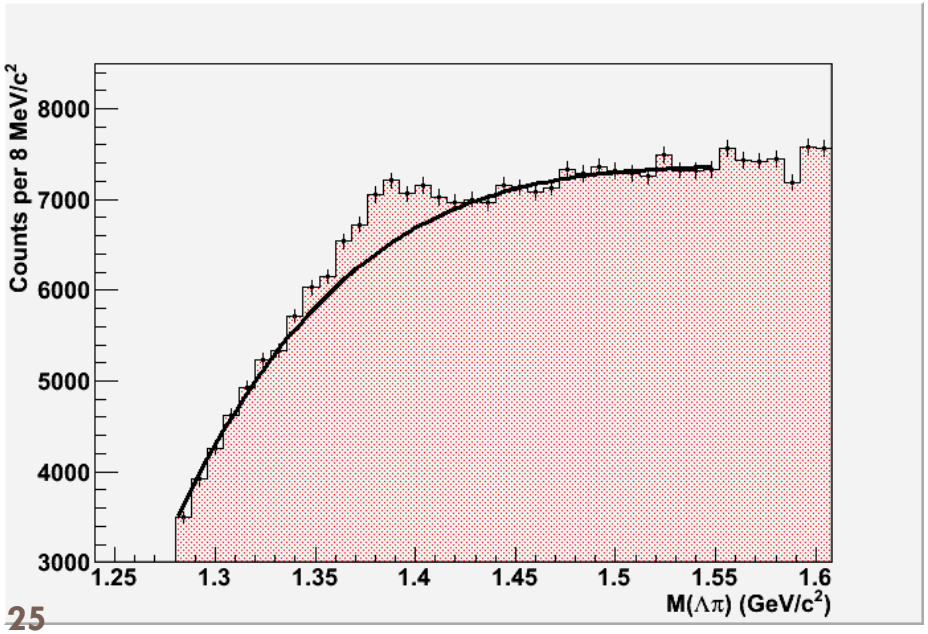


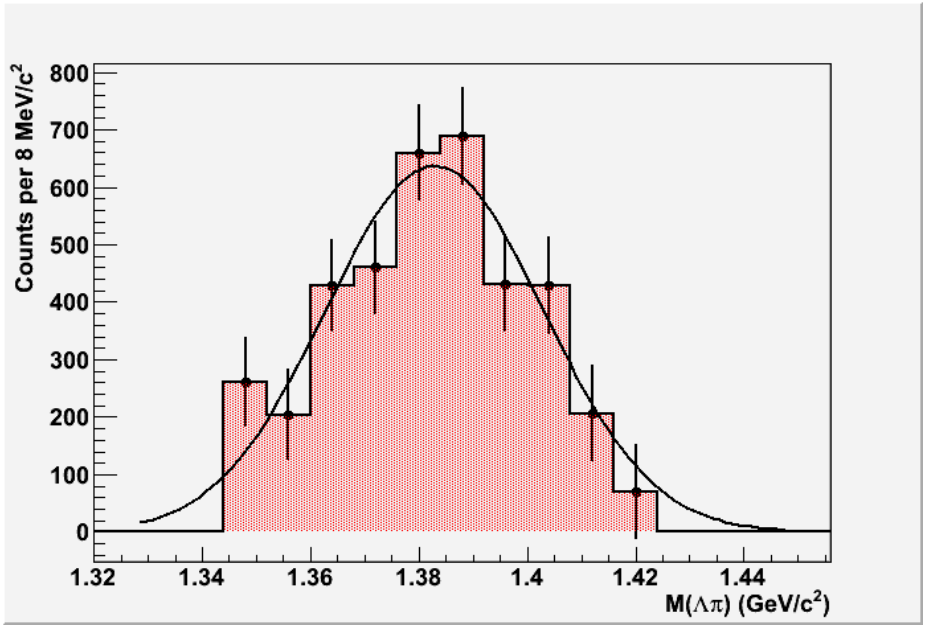
Sim data LHC10d1/d4

$1.4 < p_t < 1.6$ GeV/c



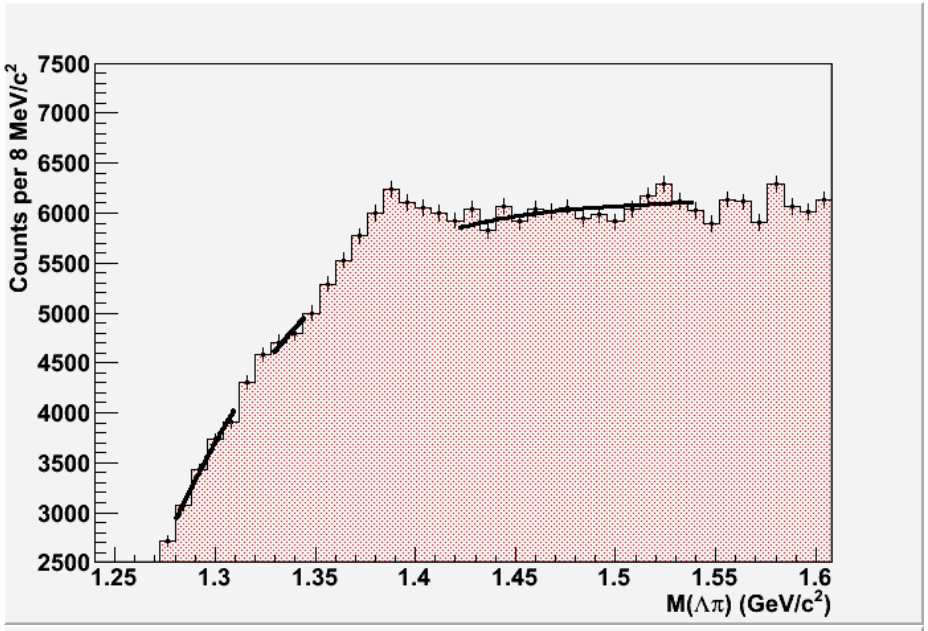


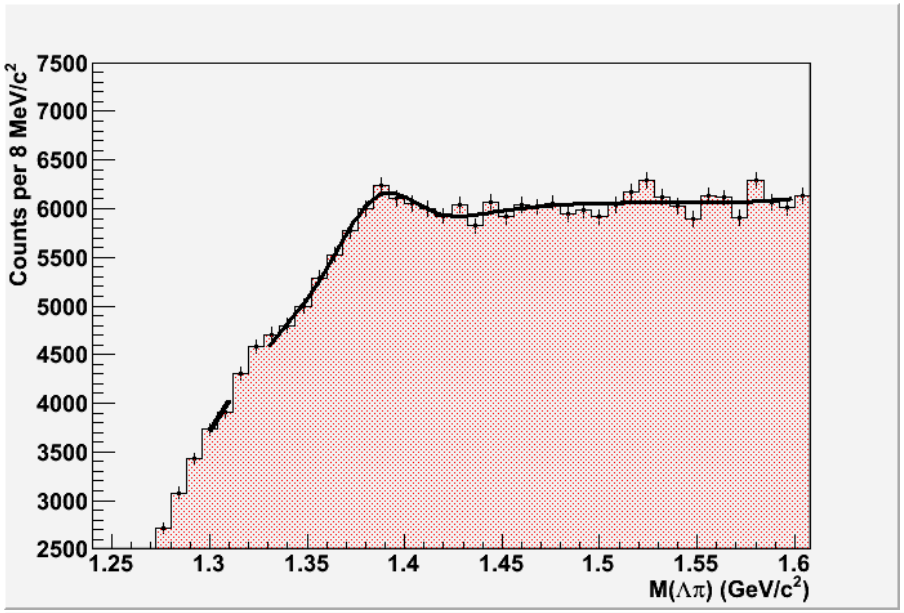


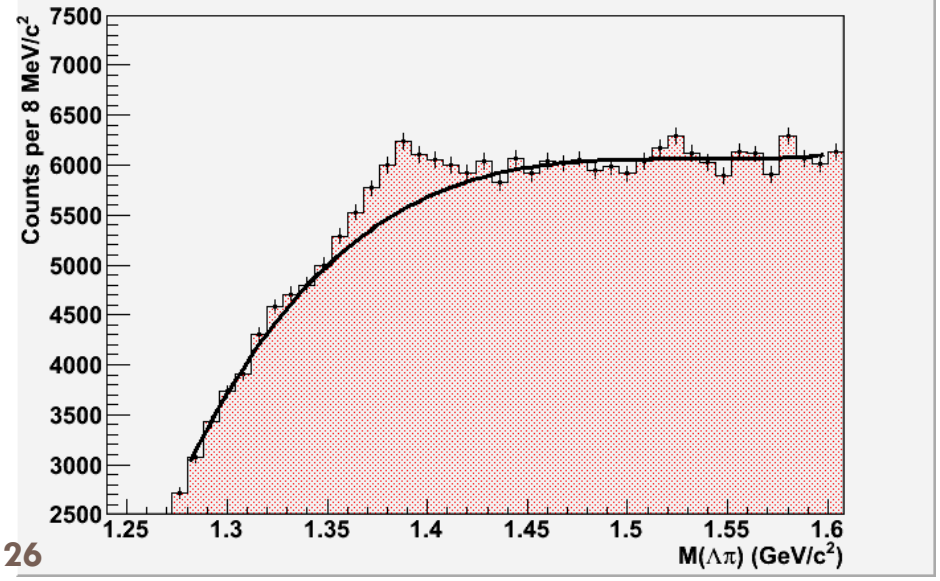


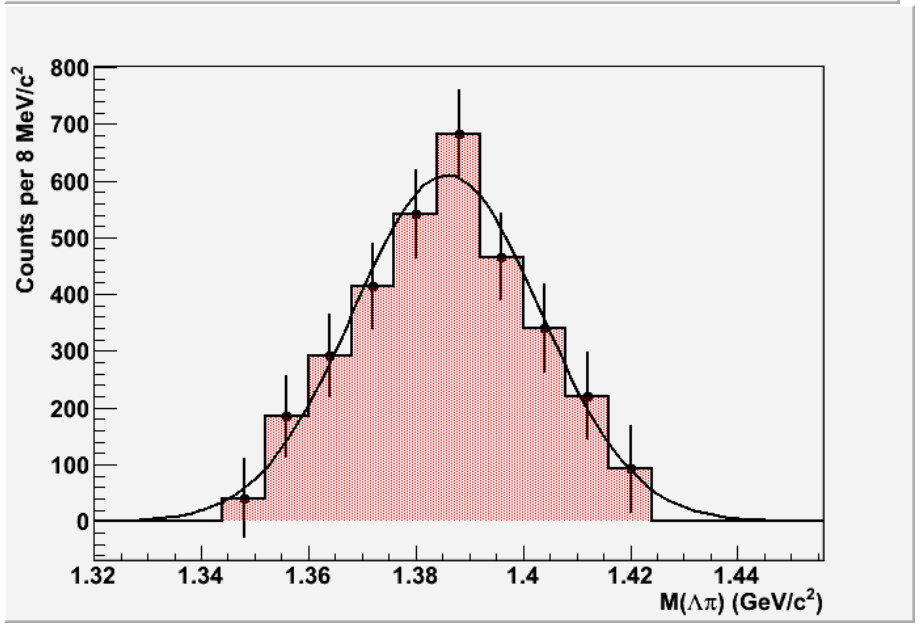
Sim data LHC10d1/d4

$1.6 < p_t < 1.8$ GeV/c



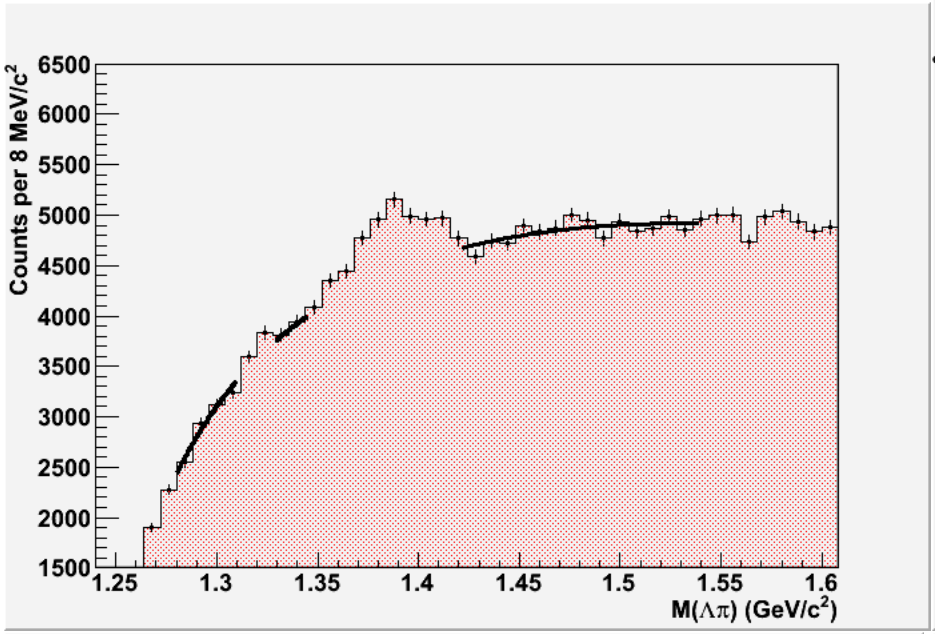


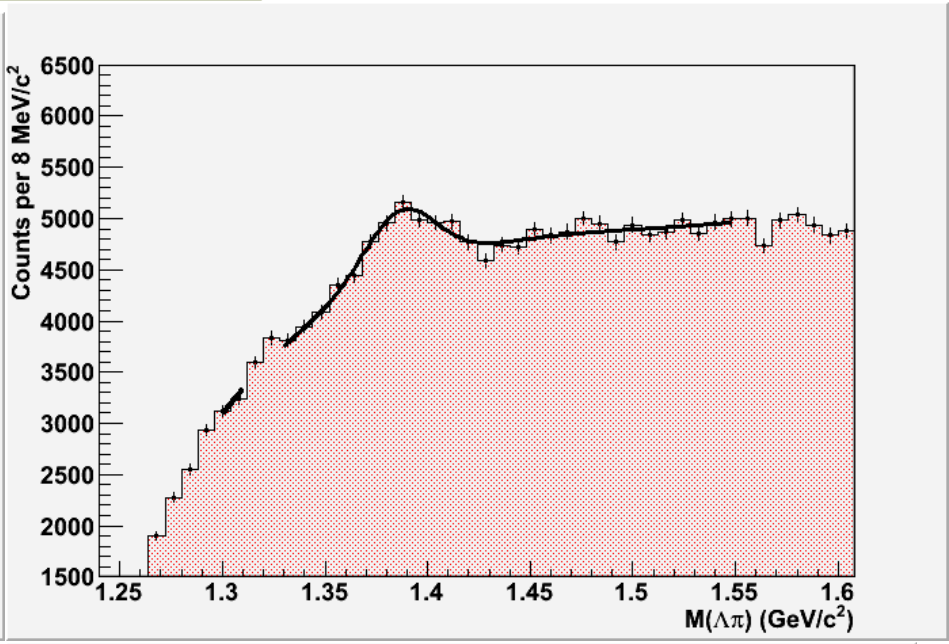


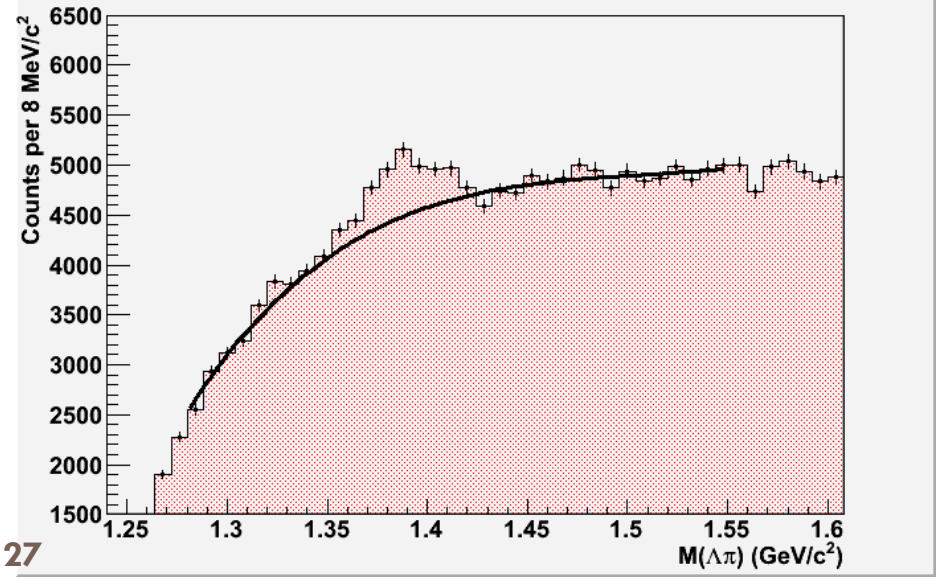


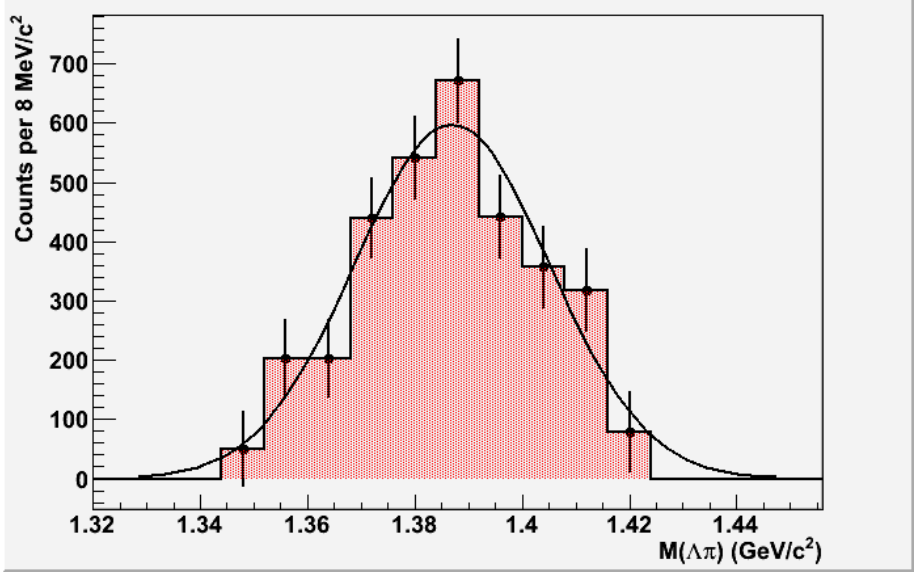
Sim data LHC10d1/d4

$1.8 < p_t < 2.0$ GeV/c



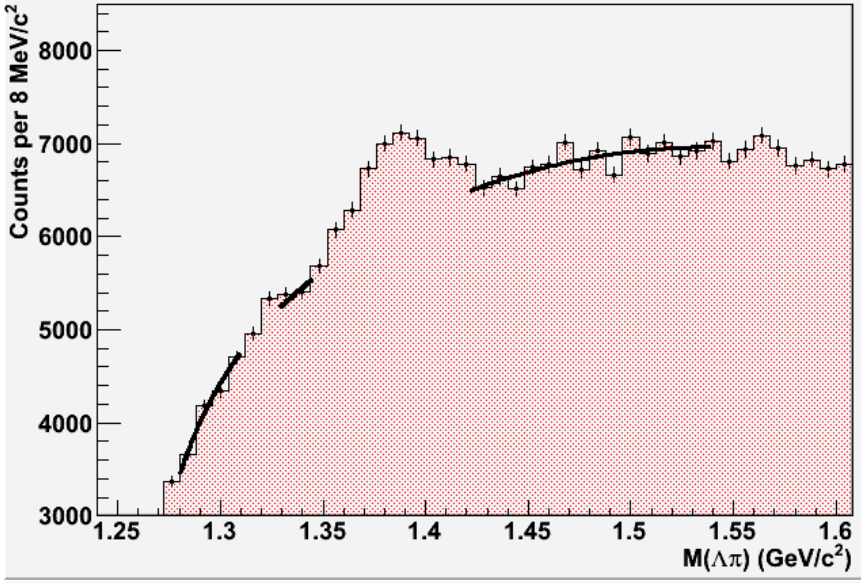


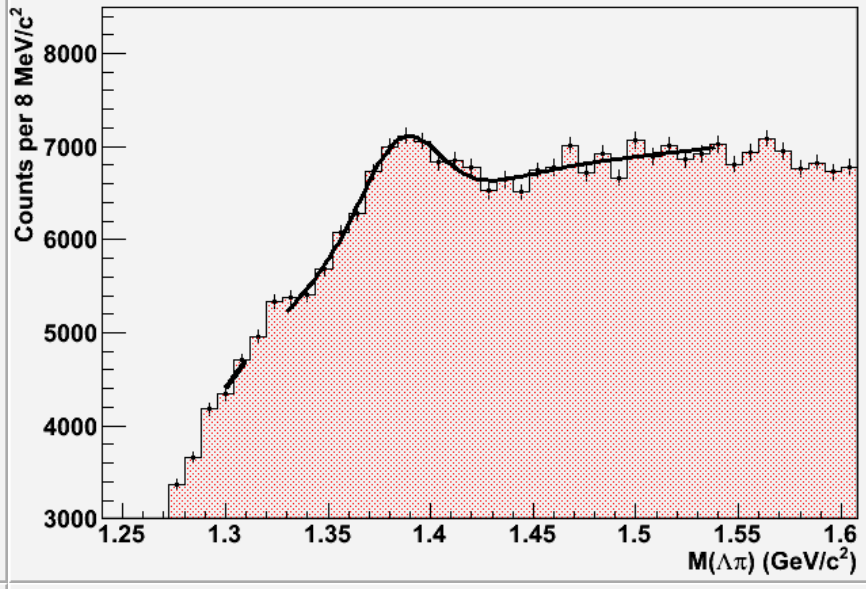


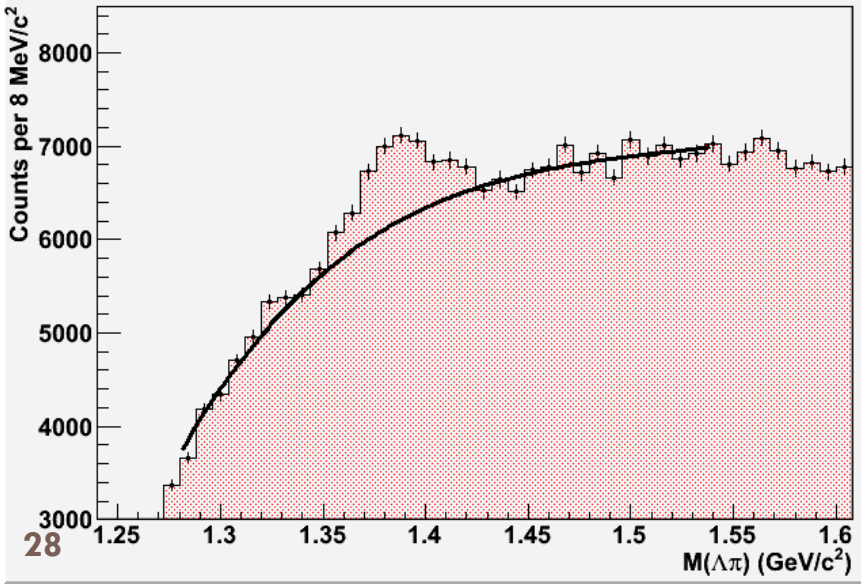


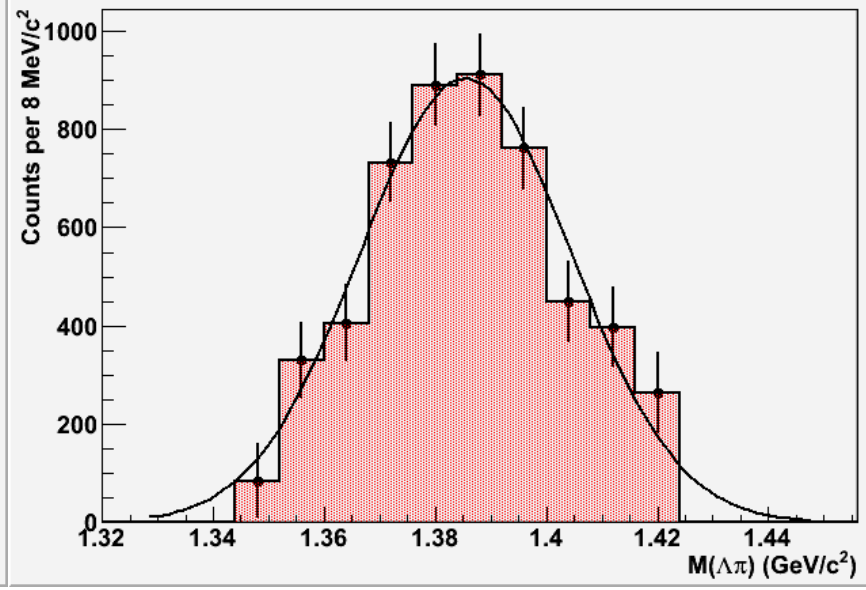
Sim data LHC10d1/d4

$2.0 < p_t < 2.4$ GeV/c



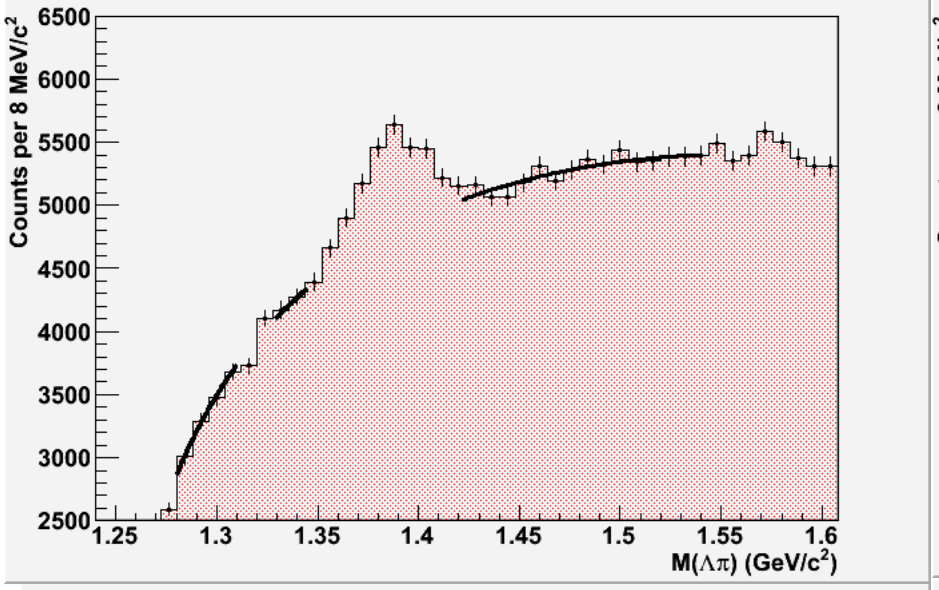


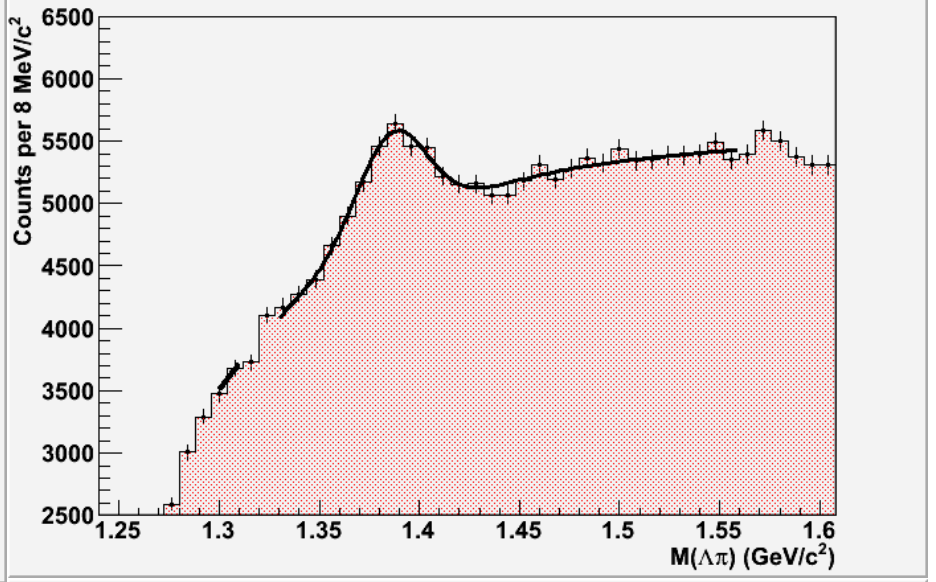


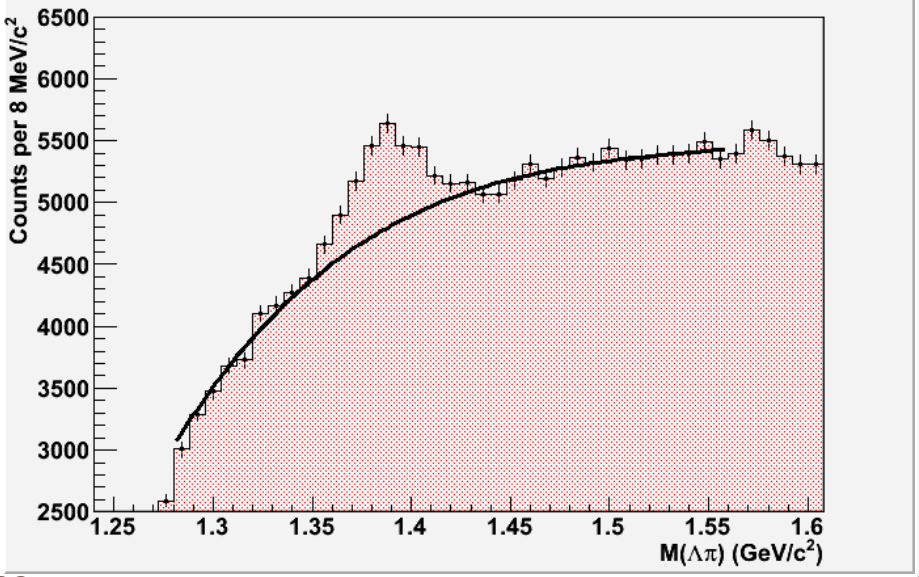


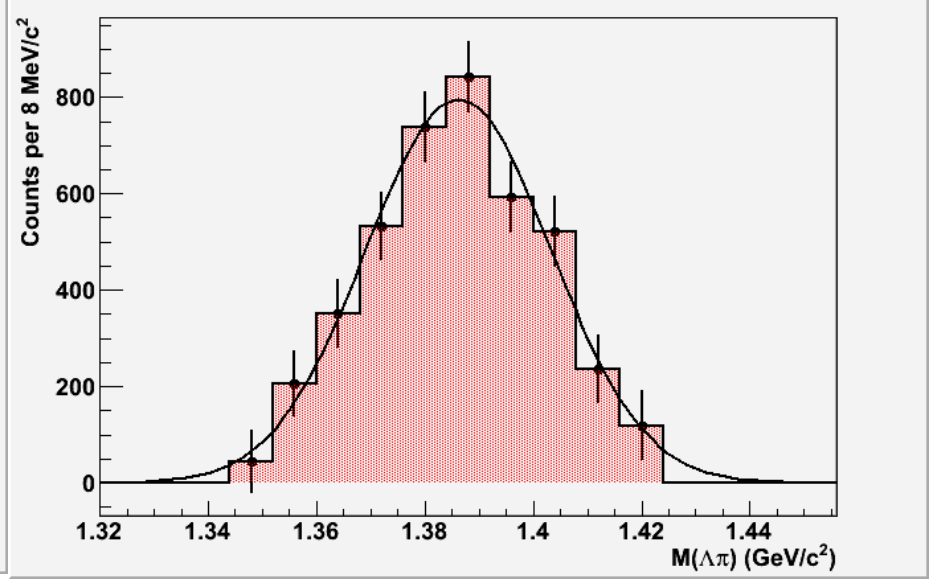
Sim data LHC10d1/d4

$2.4 < p_t < 3.0$ GeV/c



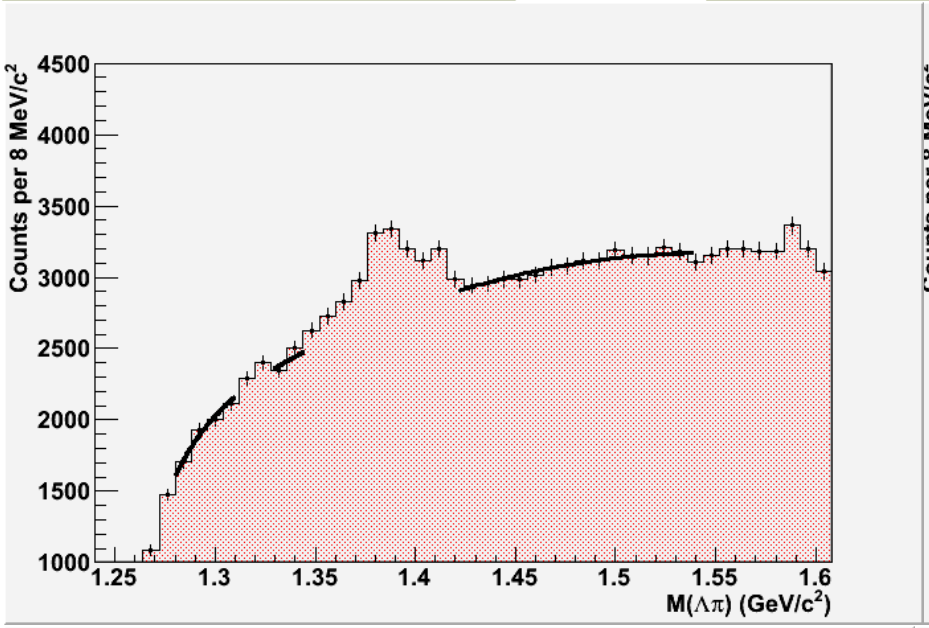


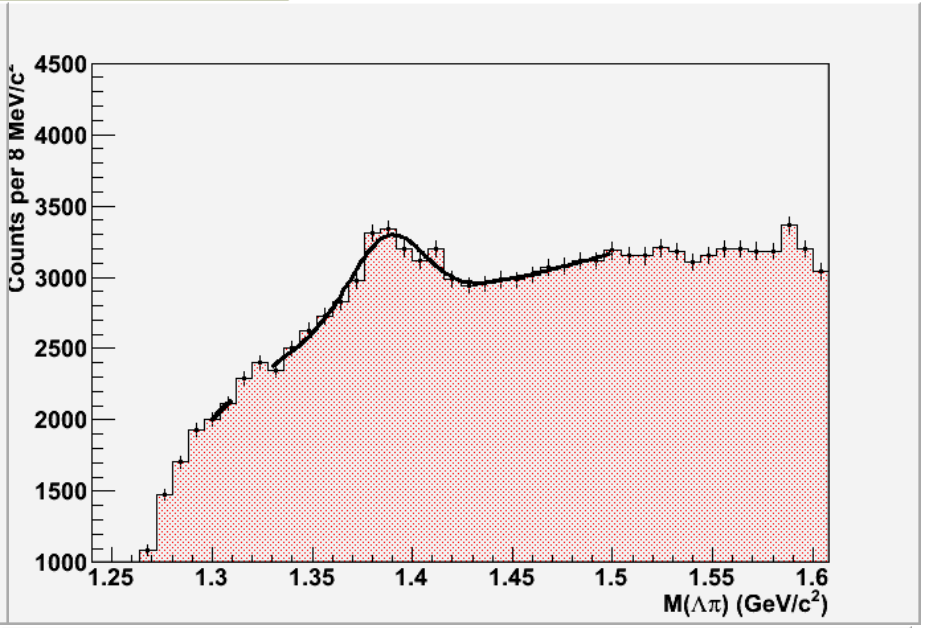


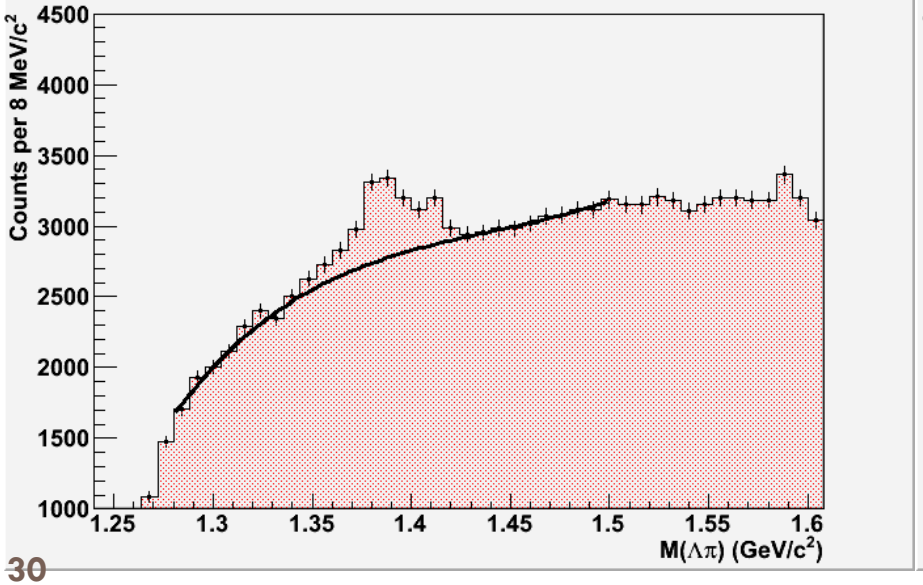


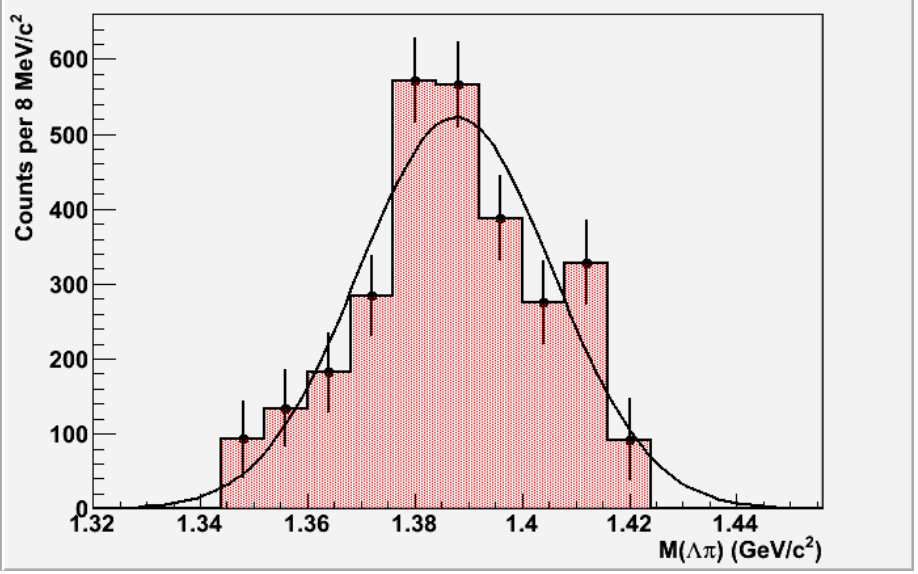
Sim data LHC10d1/d4

$3.0 < p_t < 4.0$ GeV/c







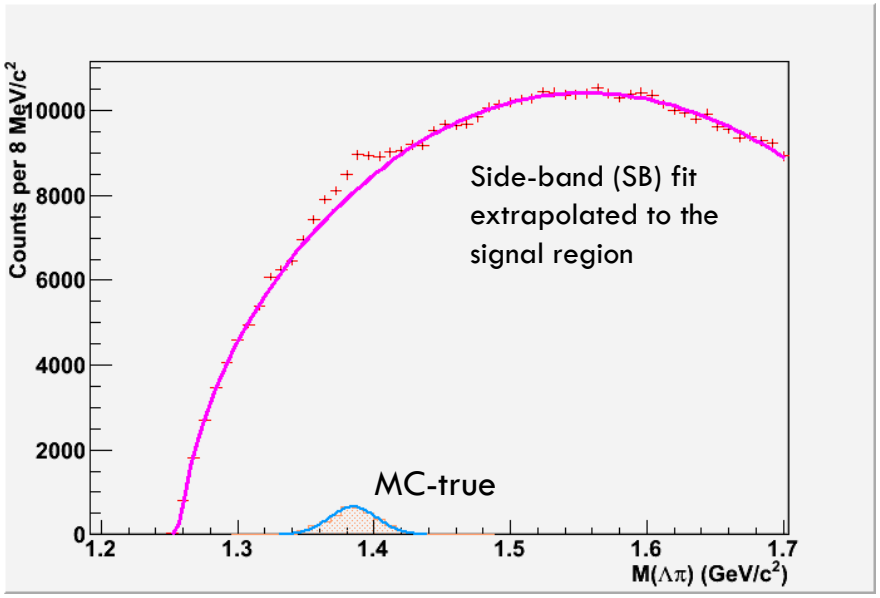


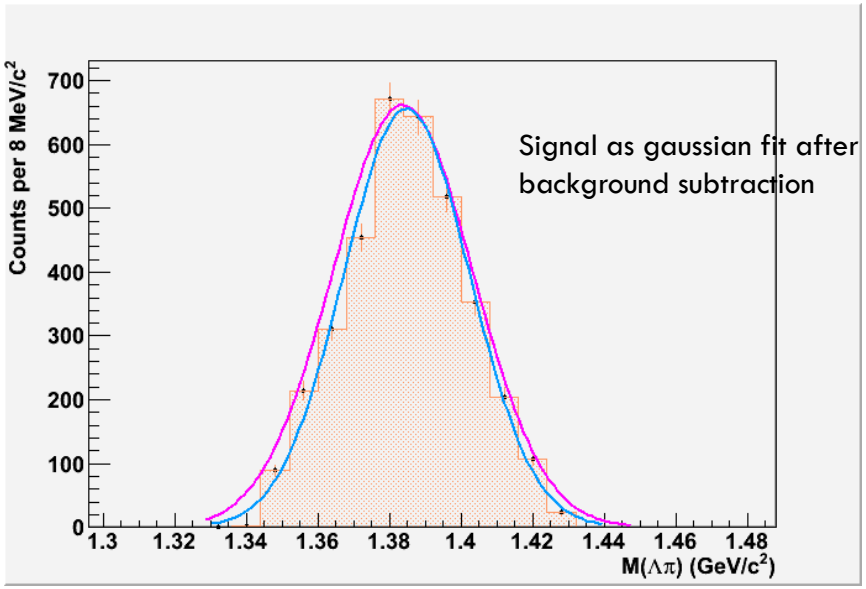
Sim data LHC10d1/d4

Old extraction procedure

$1.0 < p_t < 1.2$ GeV/c

Side-band only



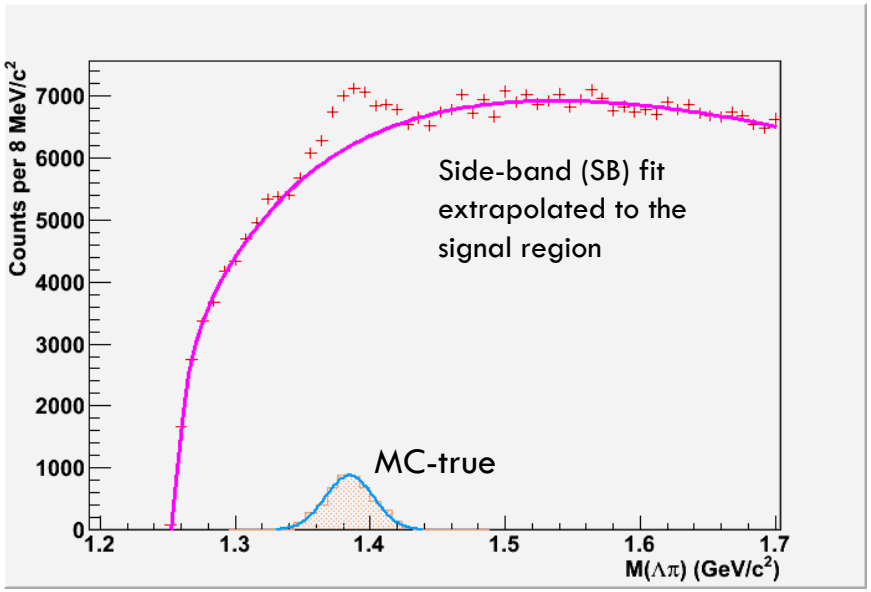


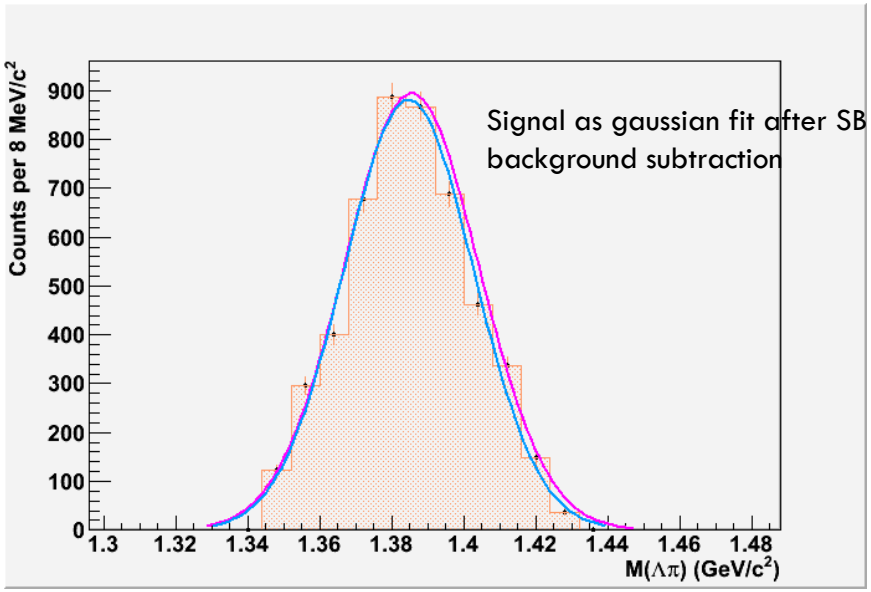
Sim data LHC10d1/d4

Old extraction procedure

$2.0 < p_t < 2.4$ GeV/c

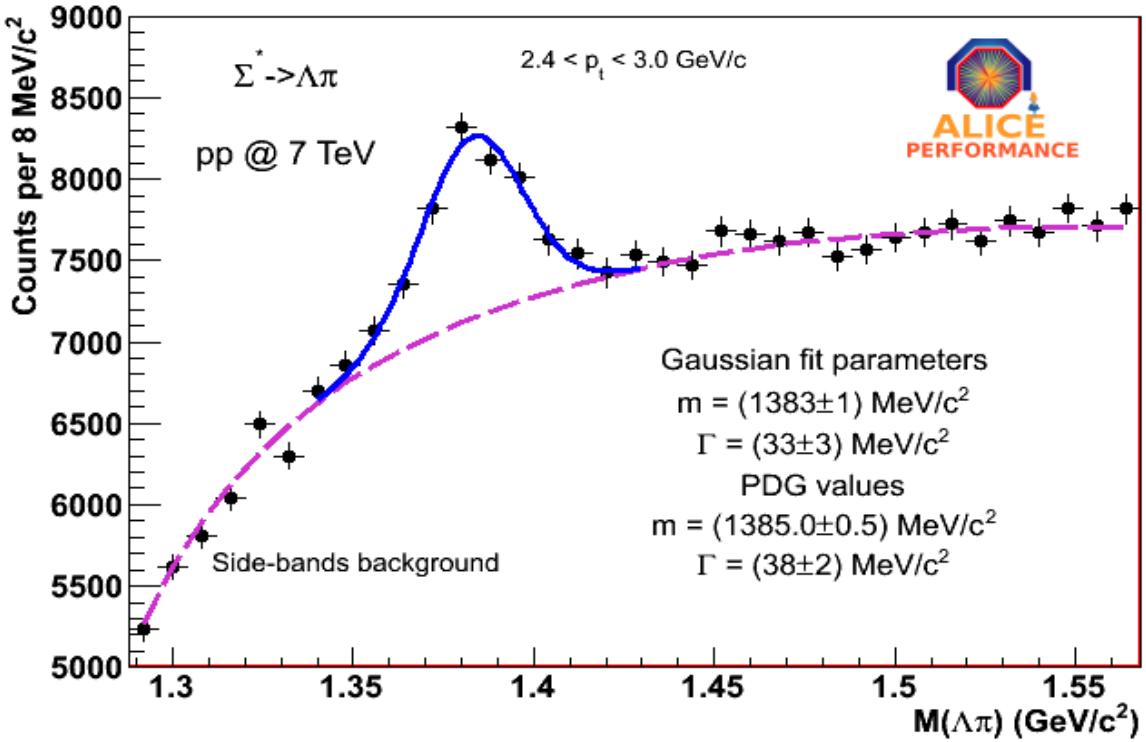
Side-band only





LHC10b+c period

Old extraction procedure

$2.4 < p_t < 3.0$ GeV/c

Side-band only