

$\Lambda(1520)$ mass/width in p+p at 7 TeV

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Introduction

$\Lambda(1520)$ in PDG:

But: **NO** in the
**MONTE CARLO PARTICLE
NUMBERING SCHEME**

Λ BARYONS
($S = -1, I = 0$)
 $\Lambda^0 = uds$

$\Lambda(1520) D_{03}$

$I(J^P) = 0(\frac{3}{2}^-)$

Mass $m = 1519.5 \pm 1.0$ MeV [m]
Full width $\Gamma = 15.6 \pm 1.0$ MeV [m]

$\Lambda(1520)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$N\bar{K}$	$45 \pm 1\%$	243
$\Sigma\pi$	$42 \pm 1\%$	268
$\Lambda\pi\pi$	$10 \pm 1\%$	259
$\Sigma\pi\pi$	$0.9 \pm 0.1\%$	169
$\Lambda\gamma$	$0.85 \pm 0.15\%$	350

STRANGE BARYONS

Λ	3122
Σ^+	3222
Σ^0	3212
Σ^-	3112
Σ^{*+}	3224 ^d
Σ^{*0}	3214 ^d
Σ^{*-}	3114 ^d
Ξ^0	3322
Ξ^-	3312
Ξ^{*0}	3324 ^d
Ξ^{*-}	3314 ^d
Ω^-	3334

$\Lambda(1520)$ in PYTHIA:

NO in the list of *Particle/parton data table* (AliDecayPythia.cxx)

→ **NO** in MC p+p events

Input info

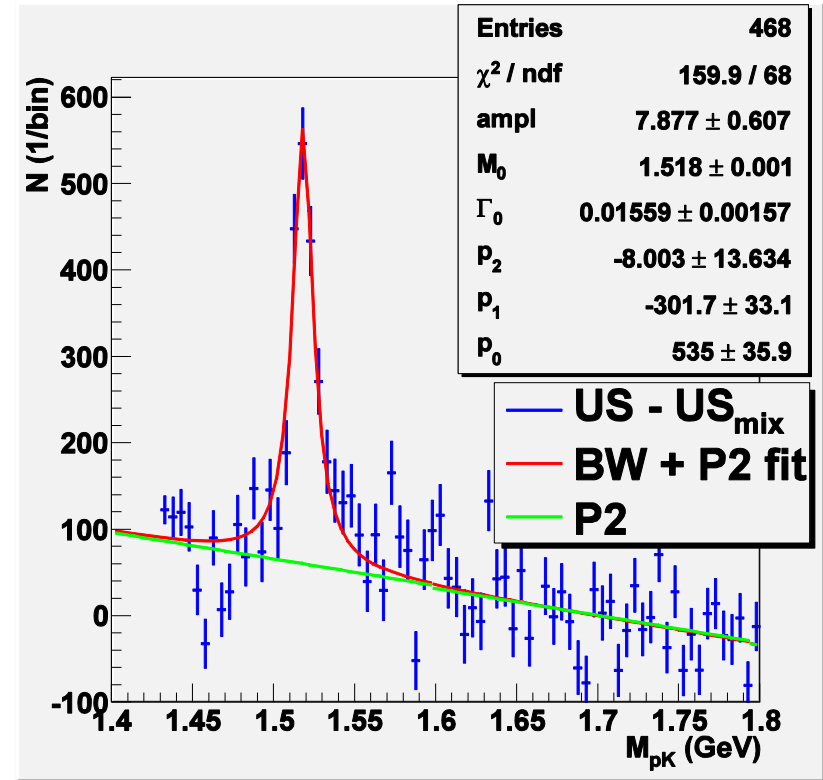
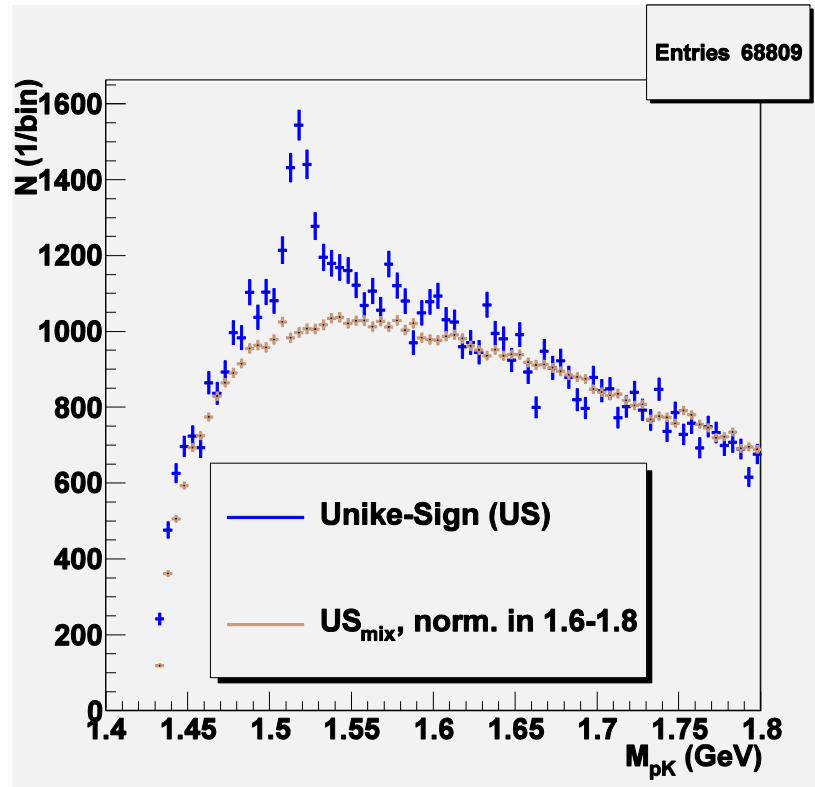
- Martin's mixing package for the RSN package:
<http://skafinfo.saske.sk/alice/mix/alimv-mix-rsn-0.3.0.tar.gz>
- PROOF (CAF, SKAF), VO_ALICE@AliRoot::v4-21-14-AN
- p+p @ 7 TeV events:
~22 Mevents, p+p at 7 TeV, LHC10b_p2, 11 runs:
115322, 115328, 115393, 117048, 117060,
117099, 117109, 117112, 117116, 117220, 117222
- PID:
Bayesian PID (BPID)
- 5 multiplicity bins:
1-11, 11-21, 21-31, 31-41, 41-51
AliMixEventCutObj(AliMixEventCutObj::kMultiplicity, 1, 11, 10);
...
AliMixEventCutObj(AliMixEventCutObj::kMultiplicity, 41, 51, 10);

Number Of Events Accepted : ~ 82% in the 5 bins

	1 - 11	11 - 21	21 - 31	31 - 41	41 - 51
22 Mevents	22%	24%	15%	12%	9%

Unlike-Sign pK pairs

all mult. bins, $|\eta| < 0.5$, all pT



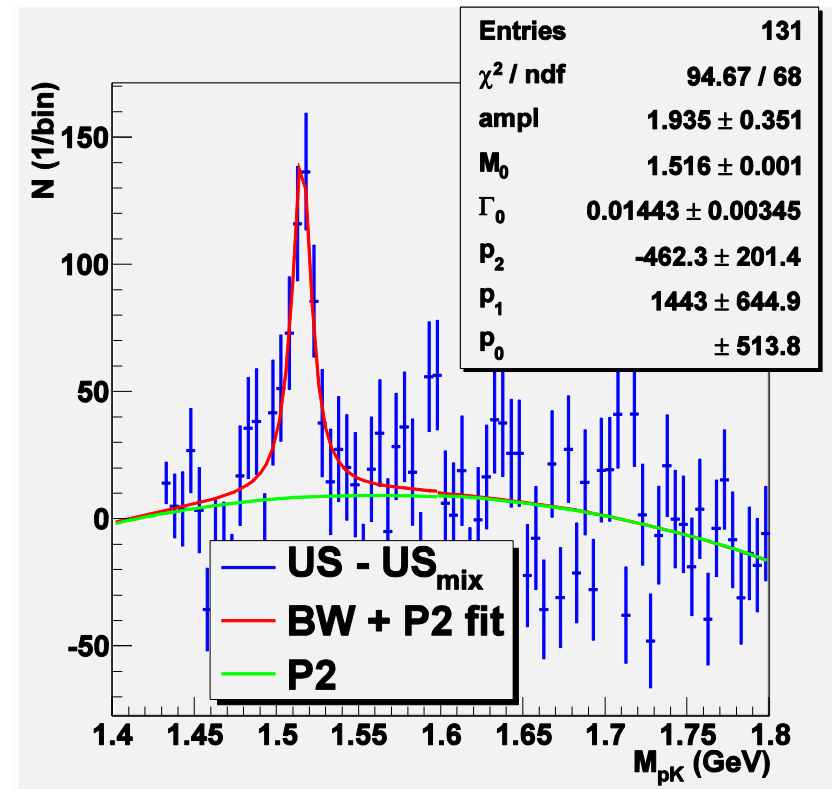
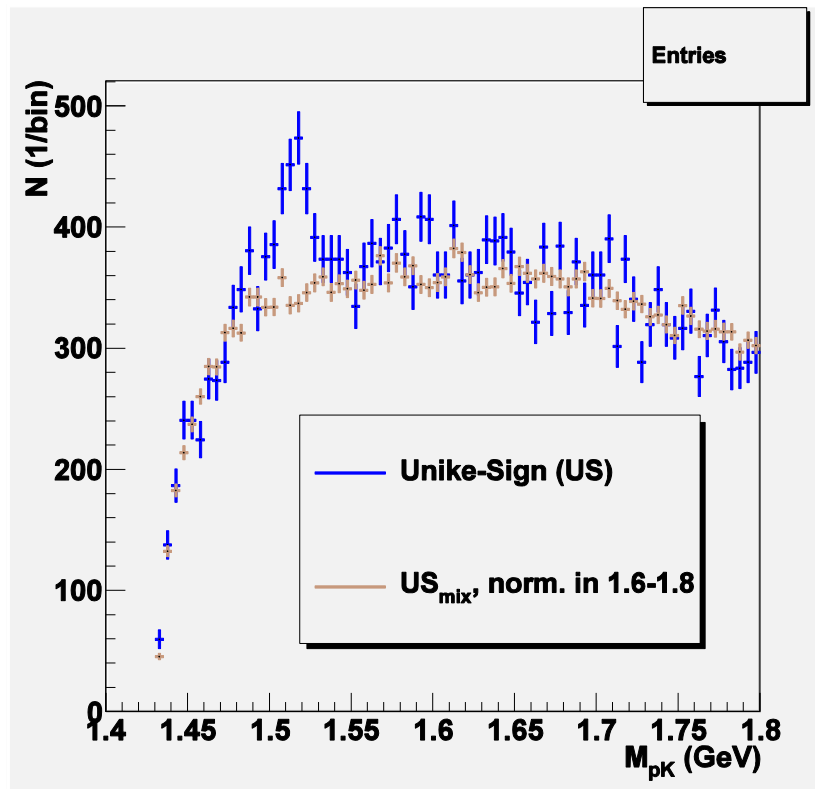
A signal with parameter values close to PDG ones for $\Lambda(1520)$:

$$M_0 = 1518 \pm 1 \quad \Gamma_0 = 16 \pm 2 \text{ MeV}$$

~ 2000 signal pairs $\rightarrow \sim$ one signal pair pe 10^4 pp events

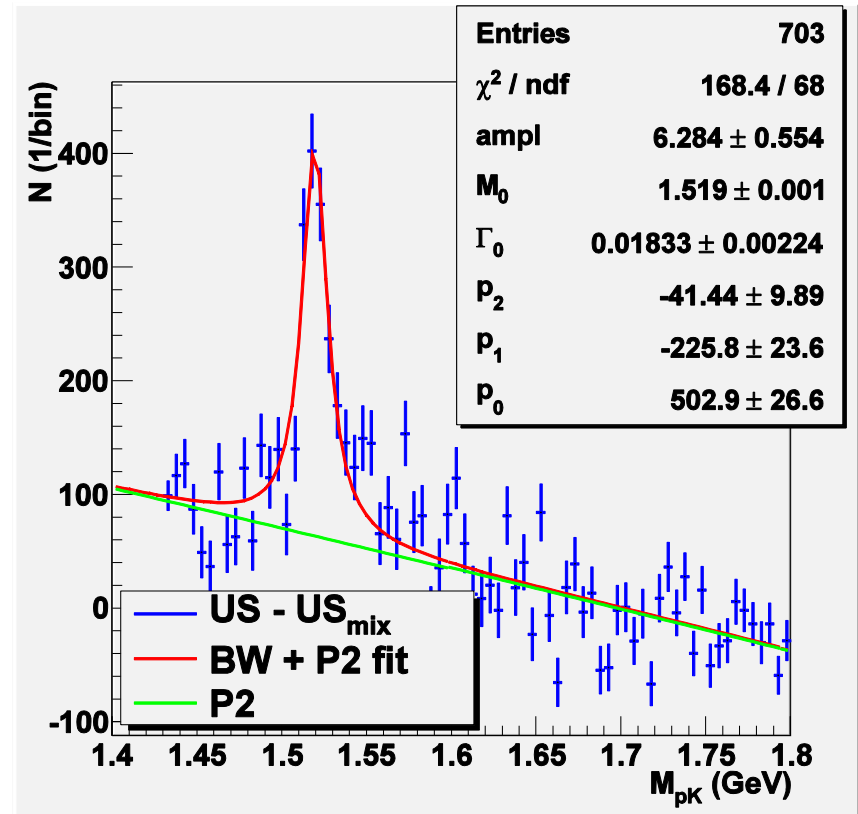
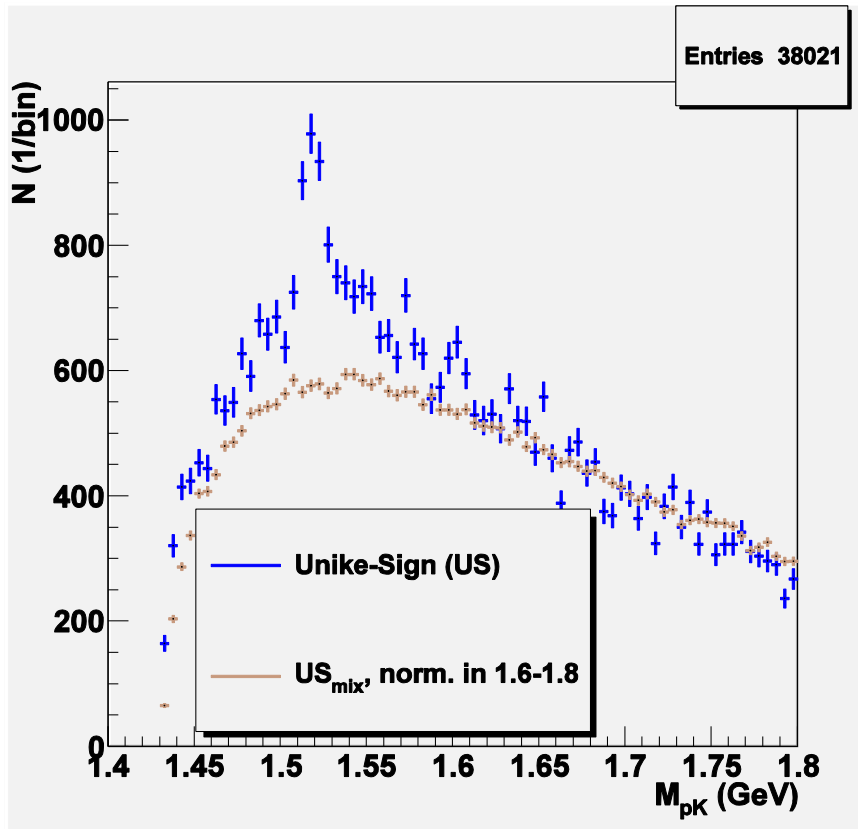
Unlike-Sign pK pairs

all mult. bins, $|\eta| < 0.5$, $p_T < 1$ GeV/c



Unlike-Sign pK pairs

all mult. bins, $|\eta| < 0.5$, $1 < p_T < 2$ GeV/c



p_T dependence

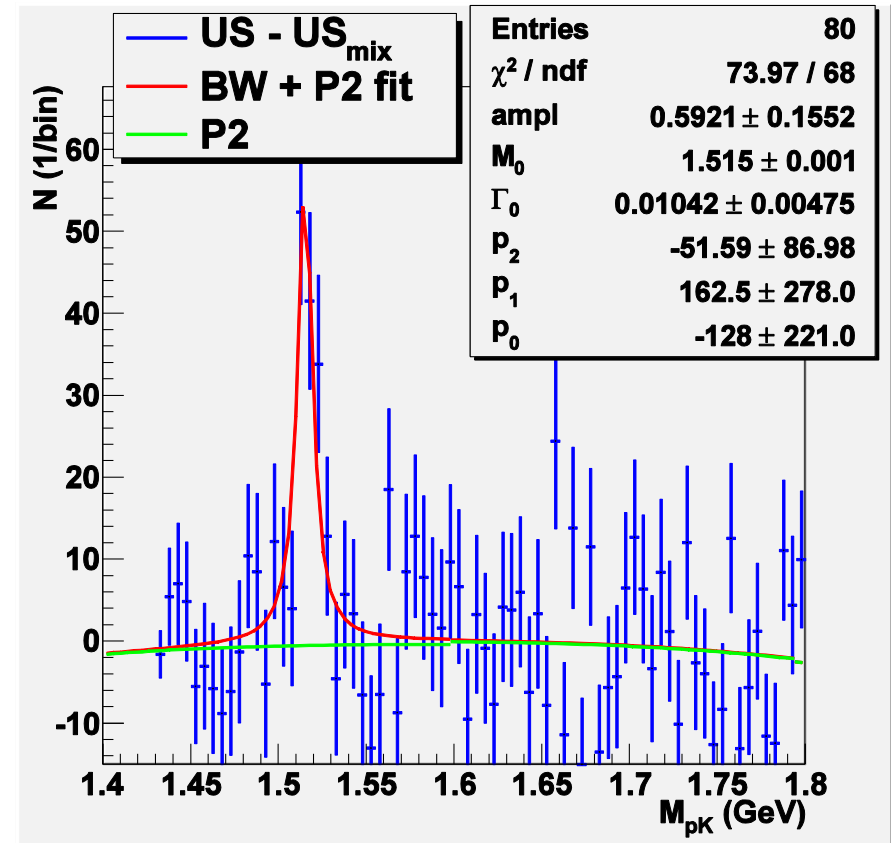
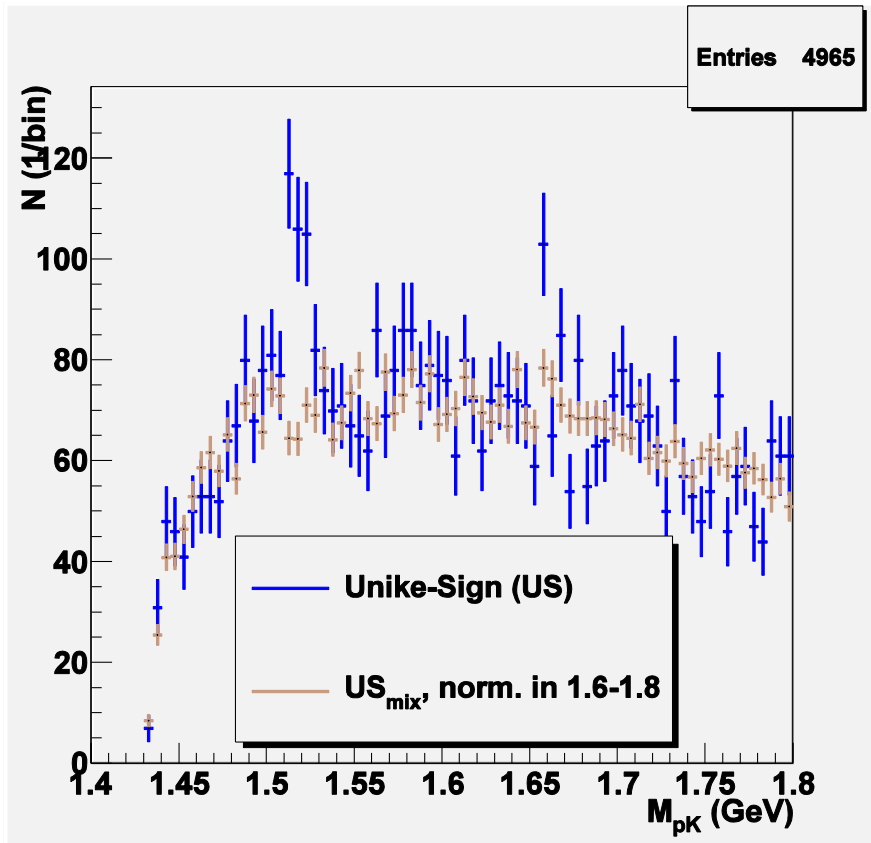
all mult. bins, $|\eta| < 0.5$

	$M_0(\text{MeV})$	$\Gamma_0(\text{MeV})$	χ^2/ndf	S/B in $\pm 3\Gamma_{\text{PDG}}$, (%)	Signif.
$p_T < 1 \text{ GeV}/c$	1516 ± 1	14 ± 3	95/68	11	8
$1 < p_T < 2 \text{ GeV}/c$	1519 ± 1	18 ± 2	168/68	29	26
ALL p_T	1518 ± 1	16 ± 2	160/68	18	23
PDG	1520 ± 1	16 ± 1	-	-	-

Hint: mass shift at $p_T < 1 \text{ GeV}/c$, $\Delta M_0 = M_0 - M_{\text{PDG}} \sim -4 \text{ MeV}$

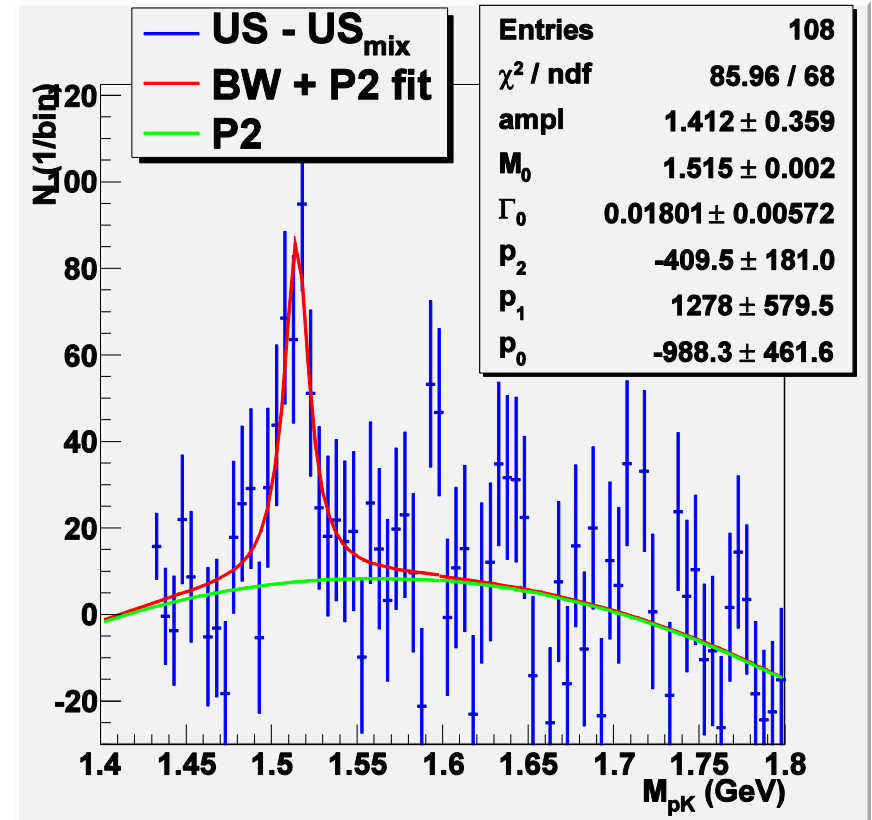
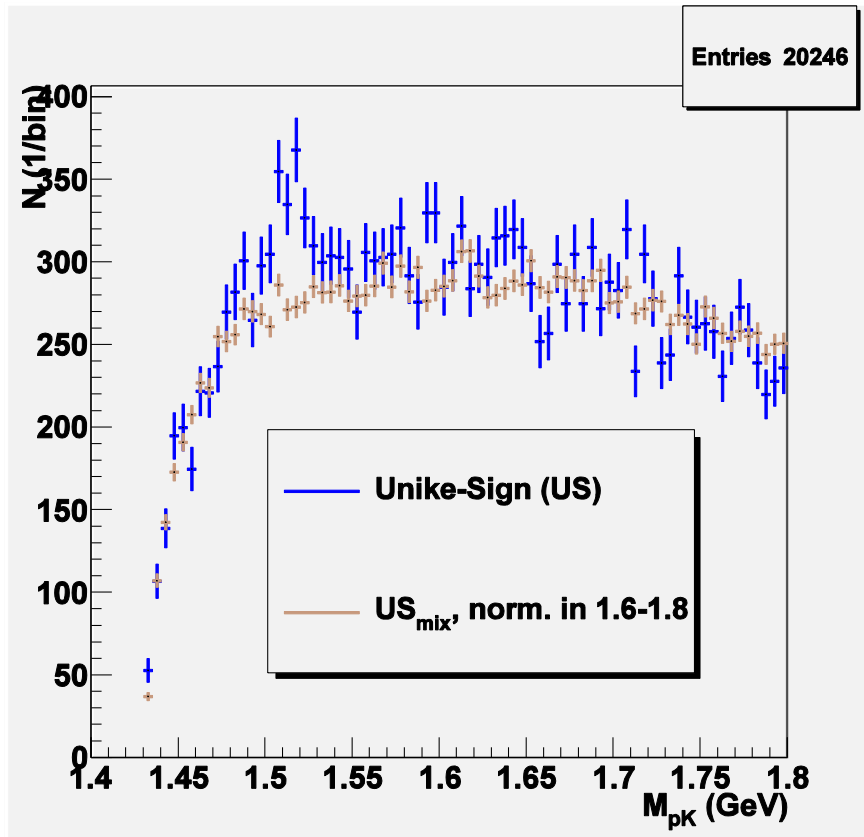
Unlike-Sign pK pairs

mult. 1- 21, $|\eta| < 0.5$, $p_T < 1$ GeV/c



Unlike-Sign pK pairs

mult. 21- 51, $|\eta| < 0.5$, $p_T < 1$ GeV/c



multiplicity dependence

$|\eta| < 0.5$, $p_T < 1$ GeV/c

	$M_0(\text{MeV})$	$\Gamma_0(\text{MeV})$	χ^2/ndf	S/B in $\pm 3\Gamma_{\text{PDG}}$, (%)	Signif.
$1 < \text{mult} < 21$	1515 ± 1	10 ± 5	74/68	13	4
$21 < \text{mult} < 51$	1515 ± 2	18 ± 6	111/68	10	7
PDG	1520 ± 1	16 ± 1	-	-	-

No multiplicity dependence of the mass

PID news

14.02.11, PWG1: TOF group “TOF update: Guidance for analysis using TOF data, LHC10b, c, (d) data assessment”

Conclusions and outlook

- during 2010 we made our journey... The TOF PID framework offered for analysis is now going to a ‘mature’ state and it is ready for AOD use
- partly due to the complexities of the first year of operation (understanding the detector and calibration techniques) and partly due to mistakes (wrong geometry) the **use of TOF tender is mandatory for LHC10b, LHC10c and LHC10d periods on ESD pass2.**
- AODs are going to be produced with proper tender settings for LHC10b, c, d
- delay on availability of calibrations from T0 is becoming an increasingly serious issue (especially with a 2011 pp run in front of us at $b^*=10$ m)
- MC has to be still improved for proper simulation of timeZero. Next in line!
- we discuss elsewhere how TOF would fit (or would not) in proposed new calibration schema

(check our answers on TWIKI: <https://twiki.cern.ch/twiki/bin/viewauth/ALICE/PWG1CalibrationStrategy>)

Summary and next step

p+p at 7 TeV, the RSN package with mixing:

- a clear signal from $\Lambda(1520) \rightarrow pK$
 - ✓ $M_0 = 1518 \pm 1$ $\Gamma_0 = 16 \pm 2$ MeV
 - ✓ Hint: mass shift at $p_T < 1$ GeV/c, $\Delta M_0 \sim -4$ MeV
 - ✓ No multiplicity dependence of the mass

next step:

- after the TOF tender will be implemented into the RSN package:
 - reanalyze with the TOF tender