FCNF and L/BNV in Λ_c decays

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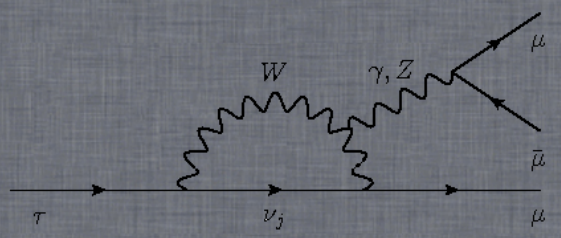
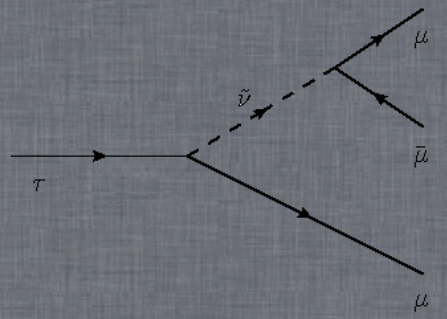
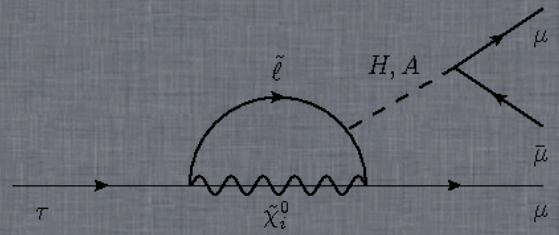
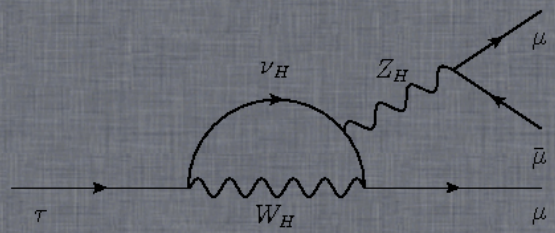
15th May 2013







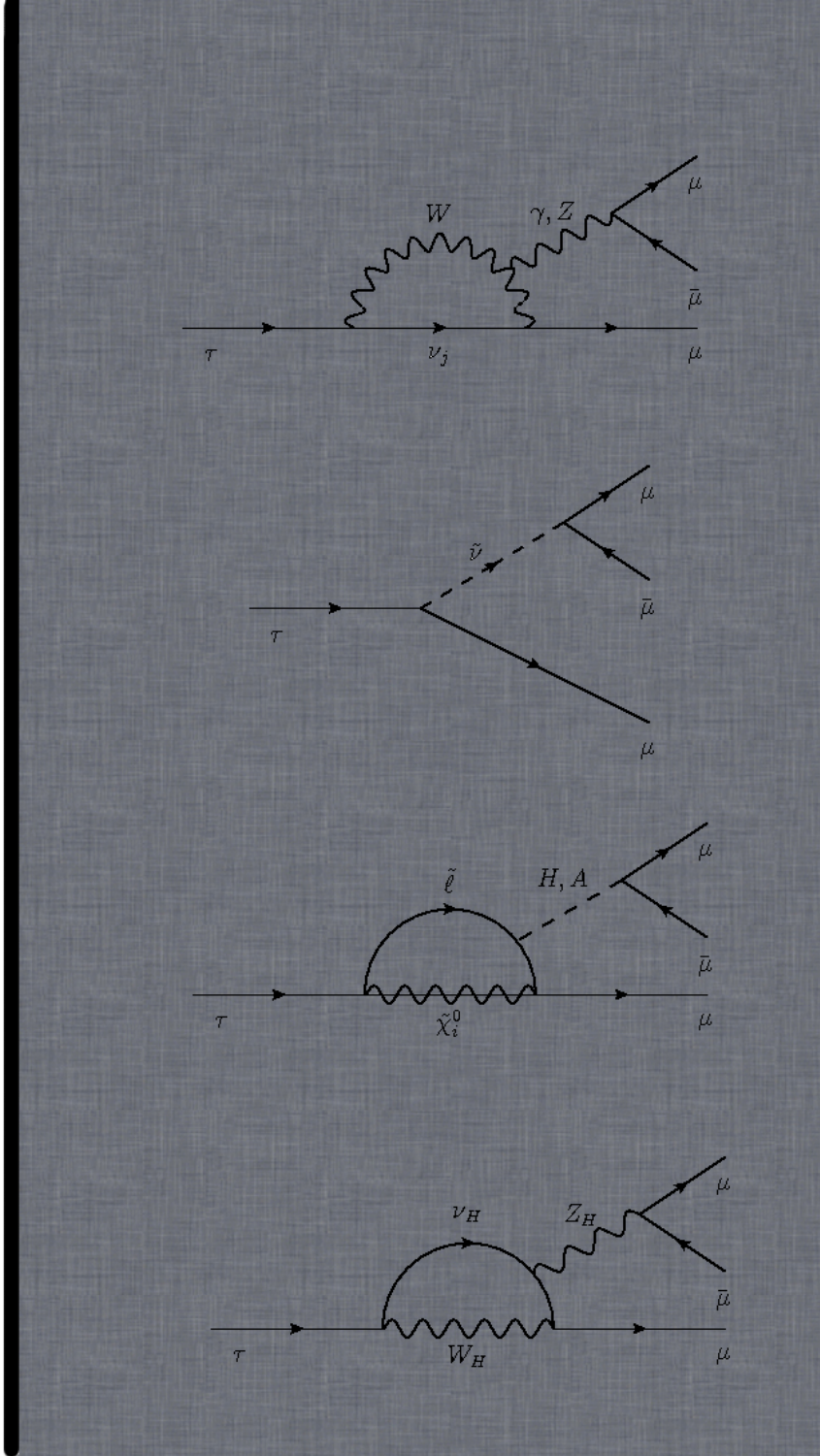


Motivation

Strategy

Comparison Λ_c vs τ

Work done so far



Motivation

Following the success of $\tau \to 3\mu$ and $\tau \to p\mu\mu$ (published 2 weeks ago) we decided to go one step further and analyse analogous channels for Λ_c.

- Decays have different physics motivations:

$\tau \to 3\mu$ LFV	$\Lambda_c \to 3\mu$ $\lvert B - L\rvert = 0$
$\tau^+ \to p\mu^-\mu^+$ $\lvert B - L\rvert = 0$	$\Lambda_c^+ \to p\mu^-\mu^+$ FCNC
$\tau^+ \to \bar{p}\mu^+\mu^+$ $\lvert B - L\rvert = 0$	$\Lambda_c^+ \to \bar{p}\mu^+\mu^+$ $\lvert B - L\rvert = 0$

- The current limits (@ 90% CL):

$\mathcal{B}(\Lambda_c^+ \to p\mu^-\mu^+) < 4.4 \times 10^{-5}$, arXiv:1107.4465
$\mathcal{B}(\Lambda_c^+ \to \bar{p}\mu^+\mu^+) < 9.4 \times 10^{-6}$
$\mathcal{B}(\Lambda_c^+ \to 3\mu)$ No constraints!

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Strategy

Follow the strategy of τ analysis:

- Take prompt Λ_c, separate approach to SL.
- Loose cut preselection.
- Train MVA on MC prompt signal and recalibrate on data.
- Mass resolution we expect similar to τ. $15 MeV$ for 3μ and $9 MeV$ for $p\mu\mu$. Mean recalibrated from data.
- Normalize to $\Lambda_c^+ \to pK^-\pi^+$, or $\Lambda_c^+ \to p\pi^-\pi^+$.
- Optimise the binning in MVA.
- CLs method for limit.

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Comparison Λ_c vs τ

Strong sides of Λ_c:

- No SM background in 3μ case ($\mathrm{D_s} \to \eta(\mu\mu\gamma)\mu\nu$)
- Smaller combinatorial background than in τ decays. ☺

Weaker sides of Λ_c:

- Smaller no. of Λ_c than τ to begin with.
- Need to study very carefully Λ_c production and backgrounds. ☹

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Work done so far

- $\Lambda_c \to p\mu\mu$ is already stripped(line was with τ line all along).
- $\Lambda_c \to 3\mu$ is being stripped in incremental stripping.
- Requested 1M signal samples. Production will today most likely.
- Background studies.

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Possible background

Resonance	$\mathcal{B}(\lambda_c \to pX)$	$\mathcal{B}(X \to \mu\mu)$
η	UNKNOWN	$(5.8 \pm 0.6) \times 10^{-6}$
ρ^0	UNKNOWN	$(4.55 \pm 0.28) \times 10^{-5}$
ω	UNKNOWN	$(9.1 \pm 3.0) \times 10^{-5}$
$f(980)$	$(2.8 \pm 1.9) \times 10^{-3}$	UNKNOWN
ϕ	$(8.2 \pm 2.7) \times 10^{-4}$	$(2.89 \pm 0.19) \times 10^{-4}$

Resonance	$\mathcal{B}(\lambda_c \to pX)$	$\mathcal{B}(X \to \mu\mu\gamma)$
η	UNKNOWN	$(3.1 \pm 0.4) \times 10^{-4}$

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Λ_c production mechanism

Process	$\mathcal{B}(X \to \lambda_c Y)$
$\Lambda_B \to \Lambda_c^+ \pi^-$	0.0088 ± 0.0032
$\Lambda_B \to \Lambda_c^+ \ell\nu$	0.05 ± 0.014
$\Lambda_B \to \Lambda_c^+ \ell\nu\pi\pi$	0.056 ± 0.031
$B \to \Lambda_c^+ \mathrm{p}\pi\pi^0$	$(1.8 \pm 0.6) \times 10^{-3}$
$B \to \Lambda_c^+ \mathrm{p}\pi\pi\pi$	$(2.3 \pm 0.7) \times 10^{-3}$
$B \to \Lambda_c^+ \Lambda_c^- K^+$	$(8.7 \pm 3.5) \times 10^{-4}$
$B \to \Sigma(2455)\mathrm{p}\pi^0$	$(4.4 \pm 1.8) \times 10^{-4}$
$B \to \Sigma(2455)\mathrm{p}\pi\pi$	$(4.4 \pm 1.7) \times 10^{-4}$
$B \to \Sigma(2455)^{--}\mathrm{p}\pi\pi$	$(2.8 \pm 1.2) \times 10^{-4}$

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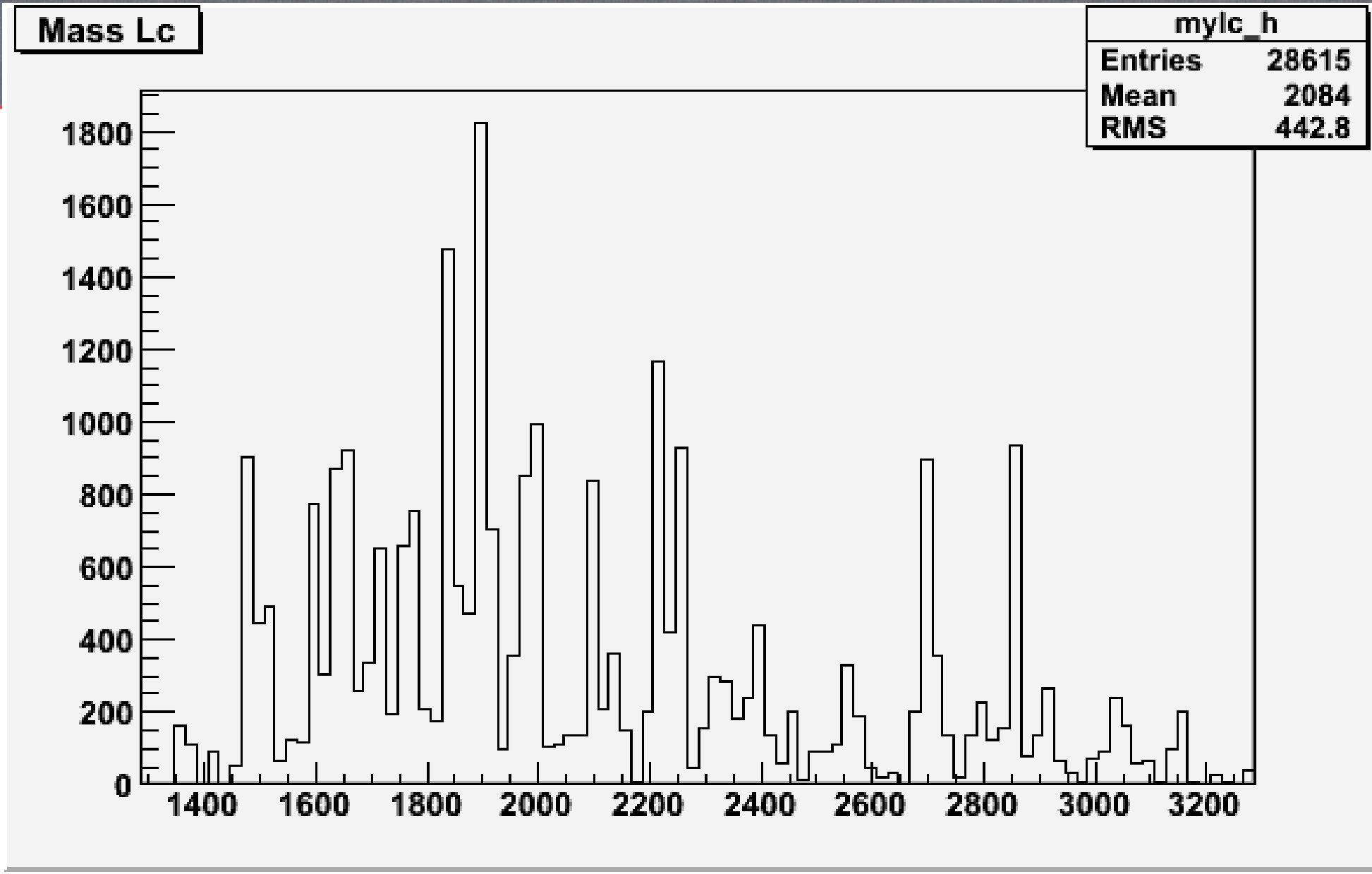
Backup Slides



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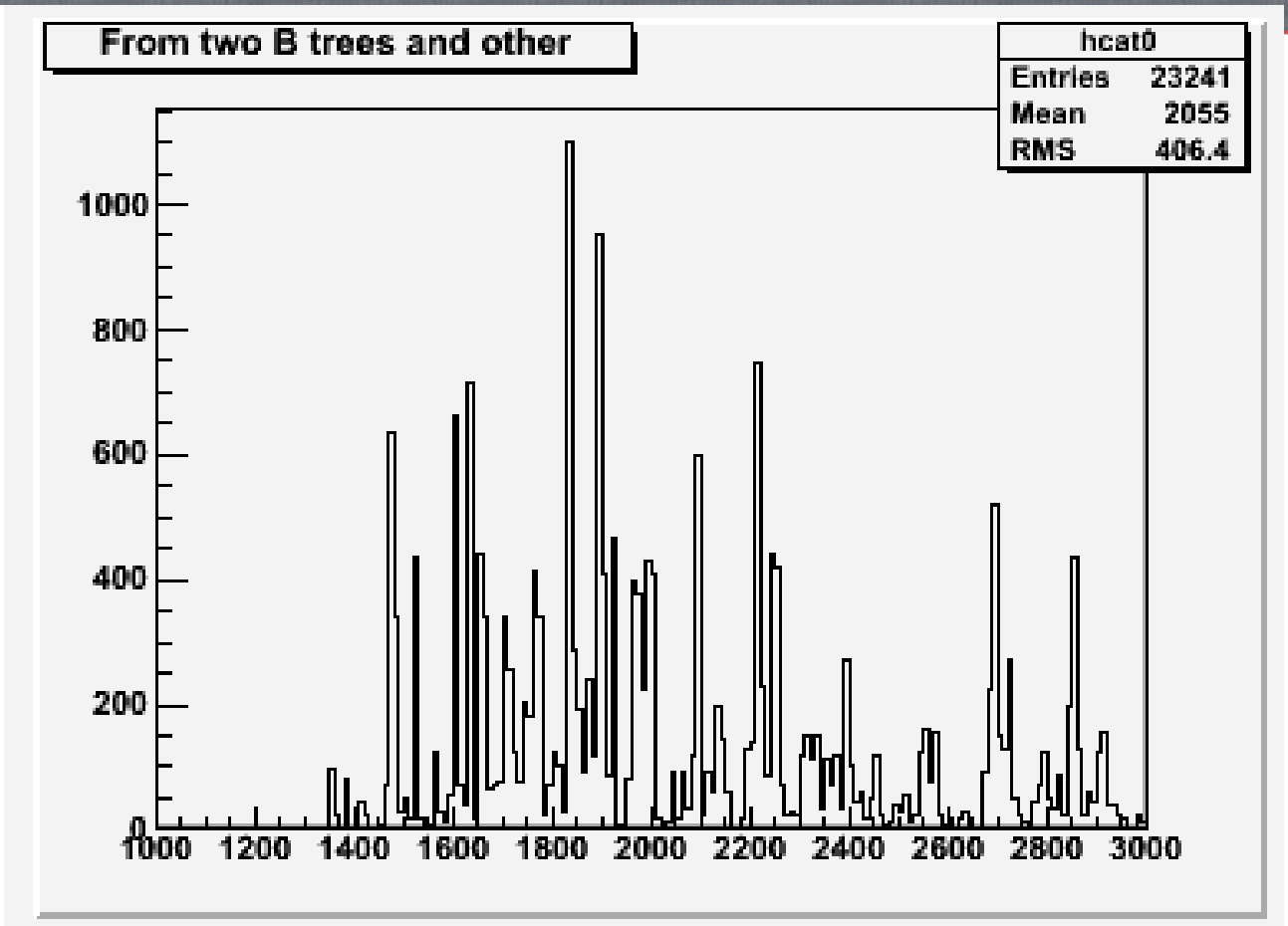

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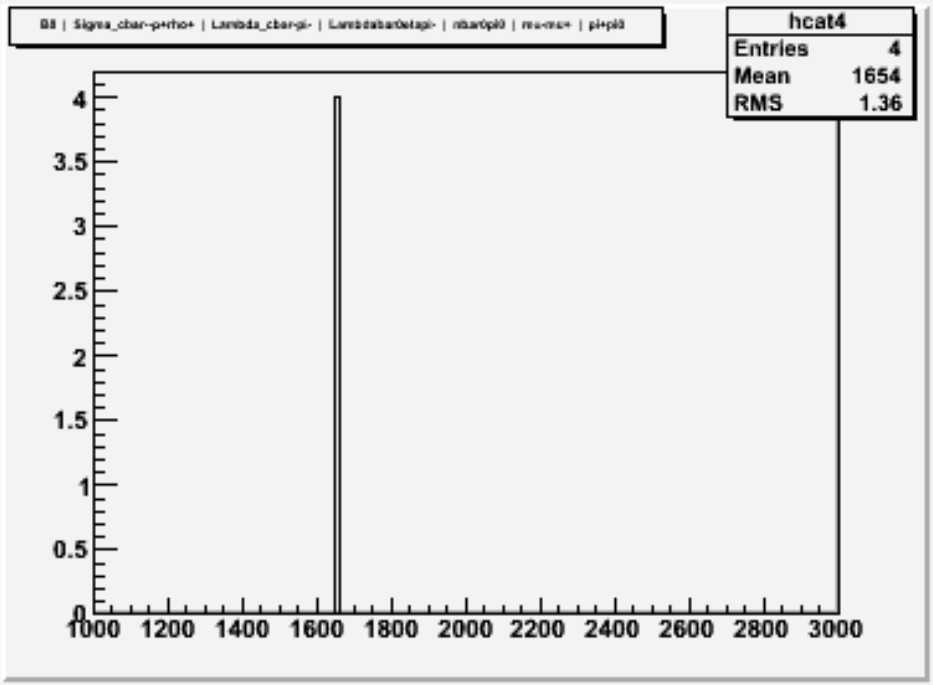

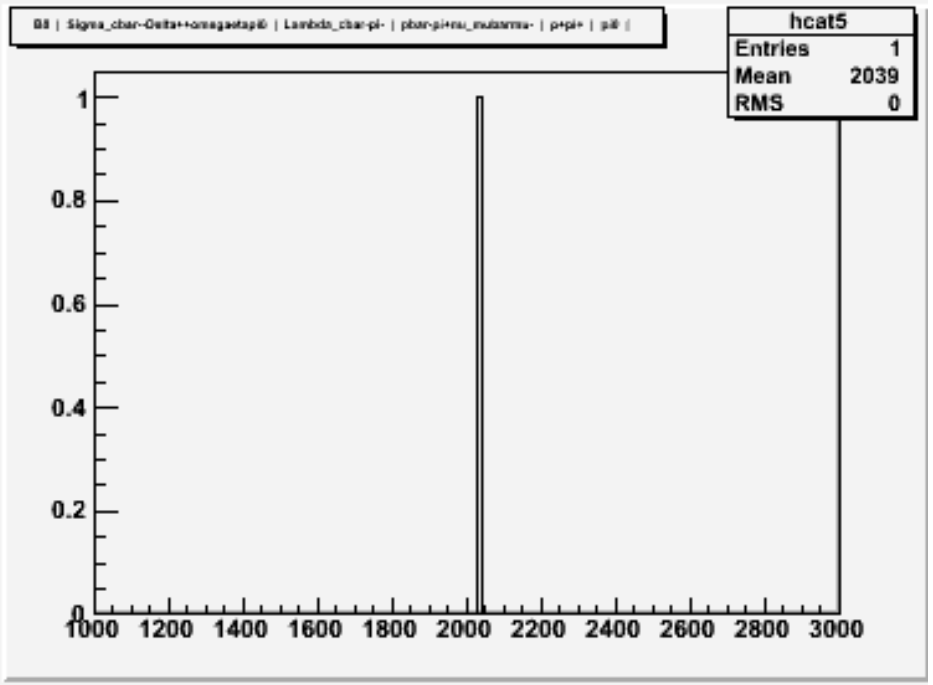

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