Updates on activities.

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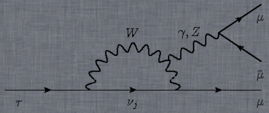
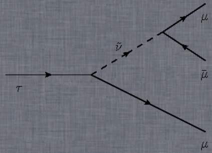
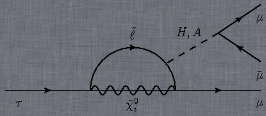
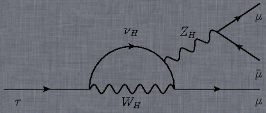
16th July 2013







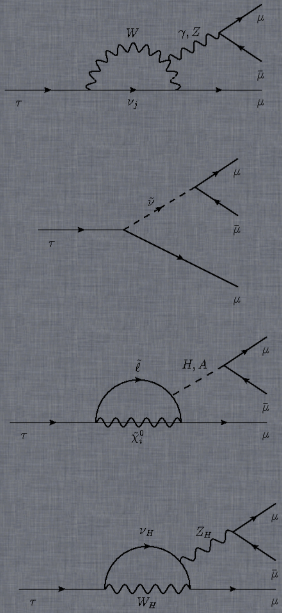


Inflaton analysis

- Reminder
- Generator Checks
- Let’s look into data
- K_s FD
- Further steps

Bose-Einstein Correlations

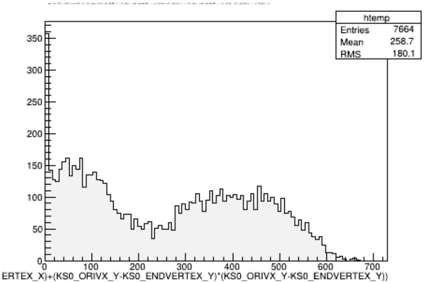
Λ_c decays



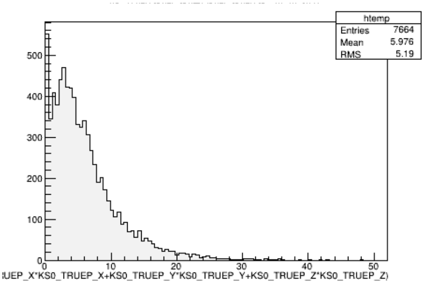
Reminder

We observed strange FD distributions in MC:

Reconstructed FD



Reconstructed life time



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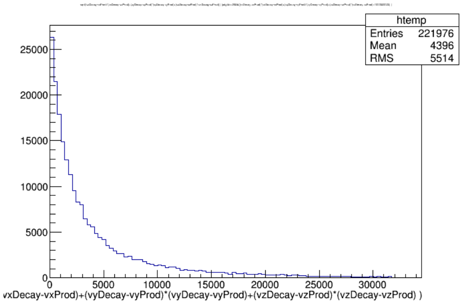
Work done so far

Cross check:

- Let's simulate decay using generator level.
- Same seeds, configuration, etc.



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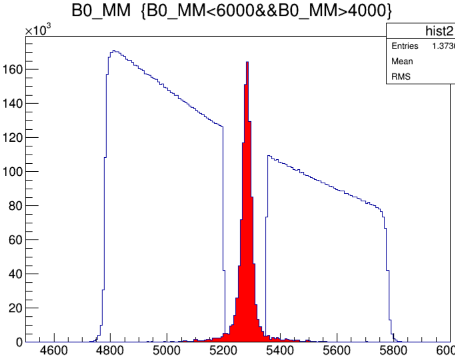
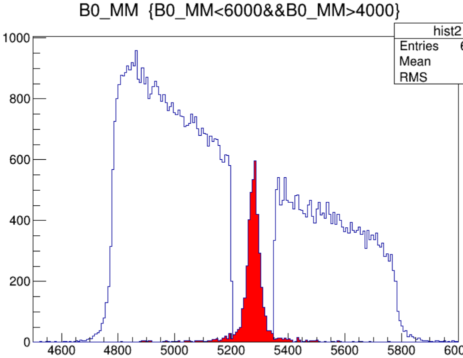
First look into data

UpStream



DownStream



Blinded: $[5200, 5350]$

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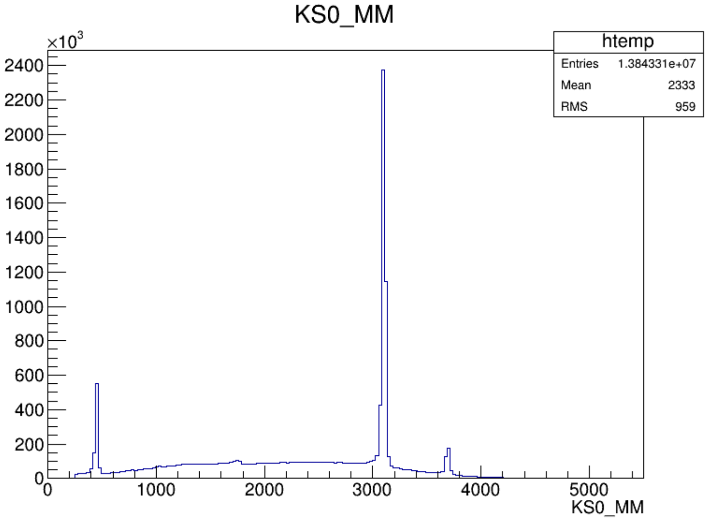
What do we have in the Inflaton mass; UPSTREAM



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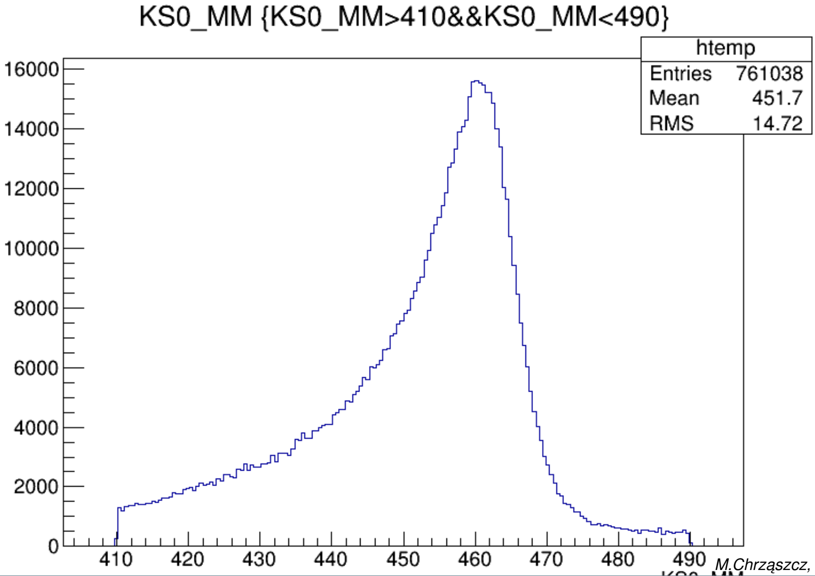
K_s



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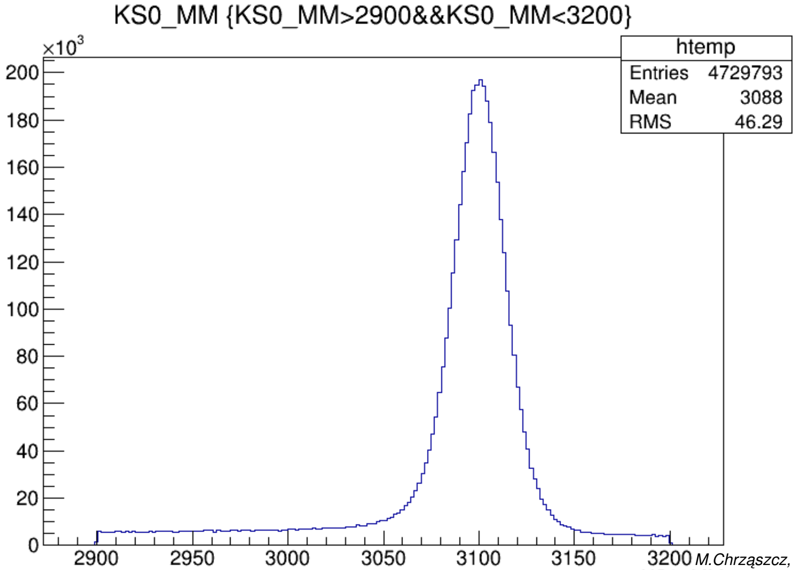
J/ψ



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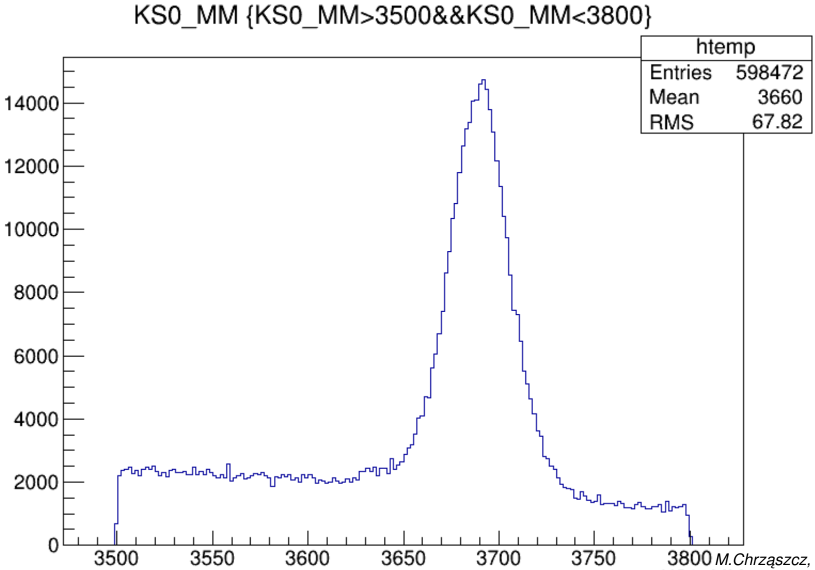
$\psi(2S)$



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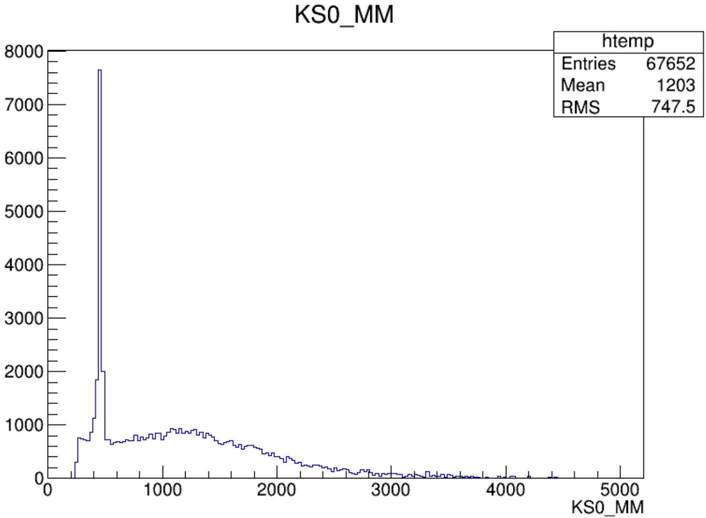
What do we have in the Inflaton mass; DOWNSTREAM



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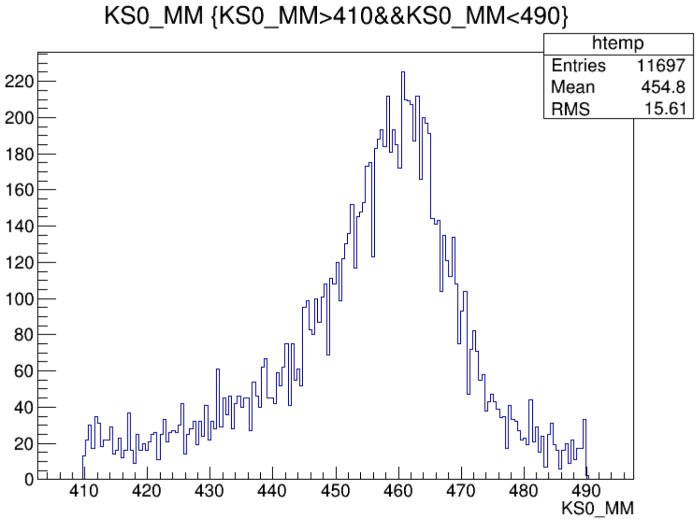
K_S



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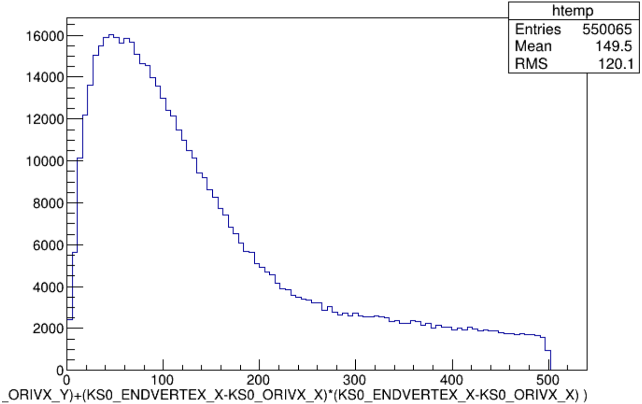
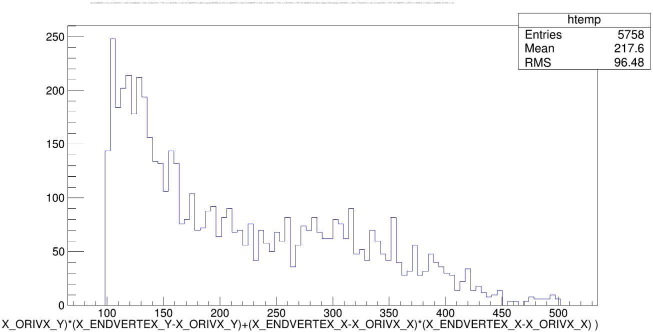
K_s FD



looks normal ☹

Let's make our inflaton more K_s like.



No bumps.Are we unlucky?

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Futher steps

- Try making selection.
- Will split the sample to up and downstream.
- Think about the normalization channel. Big problems!

Bose-Einstein Correlation

- We had a talk on soft QCD from prof. Bialas.
- BEC looks more and more interesting.
- Indirect test of statistical model.
- The plan:
  1. Measure 2 body correlations.
  2. Measure 3 body correlations. FIRST TIME MEASUREMENT!
- FDC looks bad. Not clear theoretical predictions.
- Will focus on K, π.

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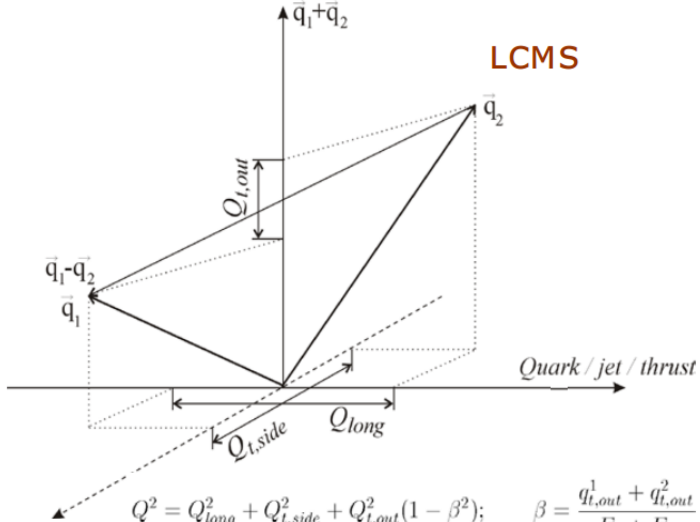
Work done since last meeting

- BEC predicts and enhancement of pars in low Q region.
- To interpret you need Longitudinal Central Mass System (LCMS).
- Needs a specific axis. After some discussion we decided to have two samples:Z-axis, and jet axis.
- LCMS was implemented.

Work done since last meeting



$$Q^2 = Q^2_{long} + Q^2_{t,side} + Q^2_{t,out}(1-\beta^2); \qquad \beta = \frac{q^1_{t,out} + q^2_{t,out}}{E_1 + E_2}$$

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Work done since last meeting

General Problem(since I didn't find it in literature):
We have a four vector $Q_u = q_{1u} + q_{2u}$ and it's momentum competent $\overrightarrow{p}$. We have an arbitrary versor in space: $\overrightarrow{v}$.
Question what's the boost vector $\overrightarrow{\beta}$?
Solution:$\beta_i = v_i \frac{q_i}{q_0}$

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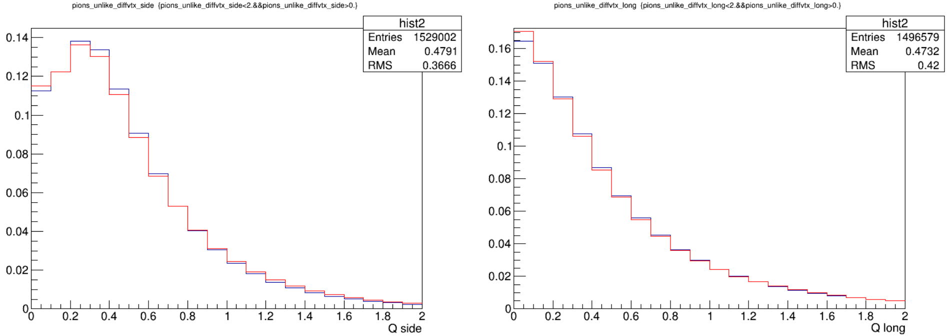
First look at BEC in LCMS



This is 0.15% of statistics!

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Motivation for Λ_c

Following the $\tau \to 3\mu$ 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:

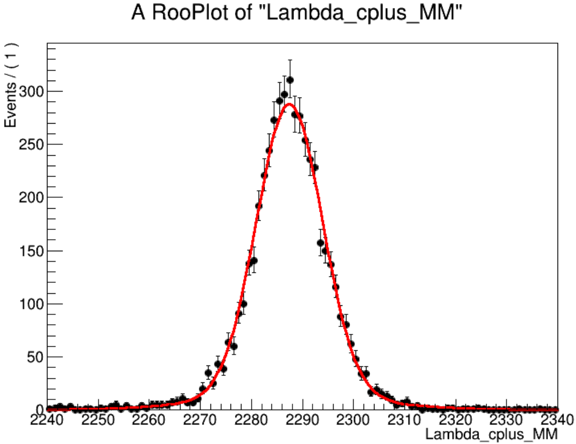
$\tau \to 3\mu$ LFV	$\Lambda_c \to 3\mu$ $\|B-L\|=0$
$\tau^+ \to p\mu^-\mu^+$ $\|B-L\|=0$	$\Lambda_c^+ \to p\mu^-\mu^+$ FCNC
$\tau^+ \to \bar{p}\mu^+\mu^+$ $\|B-L\|=0$	$\Lambda_c^+ \to \bar{p}\mu^+\mu^+$ $\|B-L\|=0$

- The current limits (@ 90% CL):

$\mathcal{B}(\Lambda_c^+ \to p\mu^-\mu^+) < 4.4\times10^{-5}$, [1]
$\mathcal{B}(\Lambda_c^+ \to \bar{p}\mu^+\mu^+) < 9.4\times10^{-6}$
$\mathcal{B}(\Lambda_c^+ \to 3\mu)$ No constraints!

[1] arXiv:1107.4465

First look at new MC



$mean = 2287.46 Mev$

$\sigma_1 = 17.5 Mev$, $\sigma_2 = 6.5 MeV$

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Plans for next week

- Continue background production for τ and Λ_c
- Have a look at isolation paramenter for Lc and tau.
- Produce all ntuples for Lc.
- Implement jet algorithm for BEC.

BACKUP

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. 15MeV for 3μ and 9MeV 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 ($D_s \to \eta(\mu\mu\gamma)\mu\nu$)
- 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.

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	$(3.1 \pm 0.4) \times 10^{-4}$

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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