

Inflaton line.

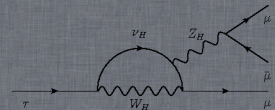
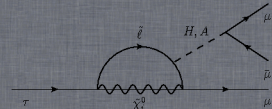
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August 24, 2013



University of Zurich^{UZH}



Inflaton analysis

Motivation:

- Probing low energy particle physics.

$$\mathcal{L}_{XSM} = \int \sqrt{-g} d^4x (\mathcal{L}_{SM} + \mathcal{L}_X + \mathcal{L}_{grav})$$

- Coupling to SM via scalar potential.
- Solves cosmological problems.
- Long lived particles. Life time $10^{-9} - 10^{-10} s$
- Mass $1 - 2 GeV$.
- Reheats the early universe.¹

¹arXiv:0912.0390, arXiv:1303.4395

Work done so far

- We simulated Signal events of $B^0 \rightarrow K^* X(\mu\mu)$. Using different masses and different life time.
- Around 1% of events survive the stripping.

Proposed changes

We propose to change:

- μ : MIPCHI2DV(PRIMARY) > 100 \rightarrow 90
- μ Add a cut: (ADOCACHI2CUT(25, ”)
- (AMAXDOCA(”) 0.1 \rightarrow 0.11

Downstream:

- μ : MIPCHI2DV(PRIMARY) > 150 \rightarrow 135
- μ Add a cut: (ADOCACHI2CUT(25, ”)
- AMAXDOCA(”) 0.2 \rightarrow 0.22

Proposed changes

We propose to change: K^*

- "MIPCHI2DV(PRIMARY)> 25 → 23

B^0 :

- BPVIPCHI2()< 60 → 50.

Results on retention

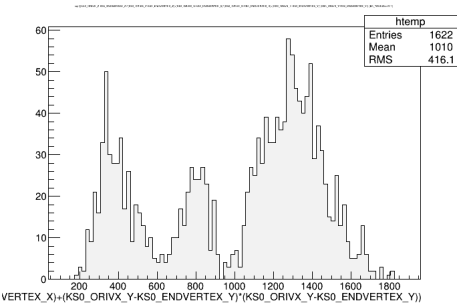
- timing: 0.747 \rightarrow 0.818
- Retention 0.0240 \rightarrow 0.0410

No micro dst possible. Very strange topology of the decay plus isolation parameter will be used.

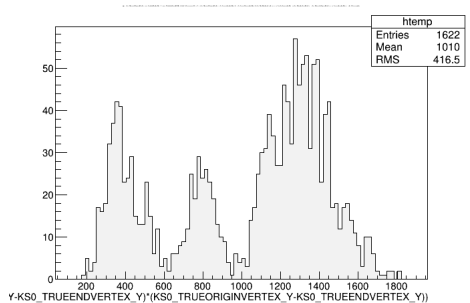
BACKUP

Flight distance of Inflaton

Reconstructed

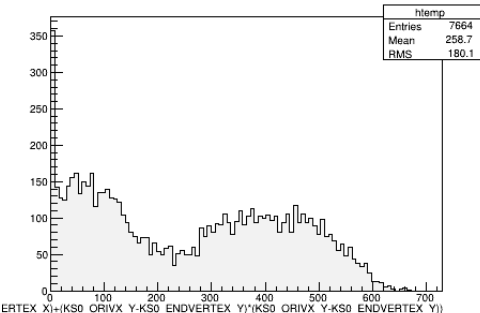


Truth Matched

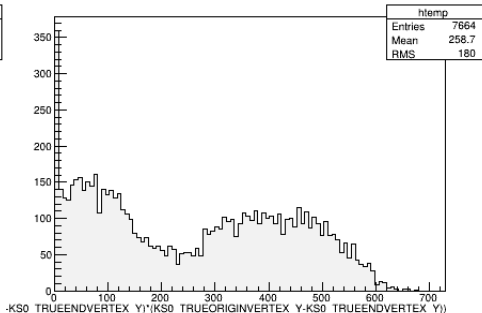


Flight distance of Inflaton, "normal" μ

Reconstructed

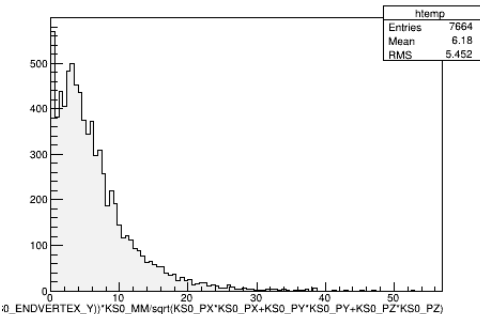


Truth Matched

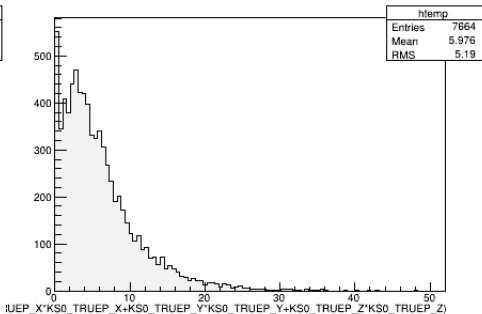


Life time of Inflaton, "normal" μ

Reconstructed

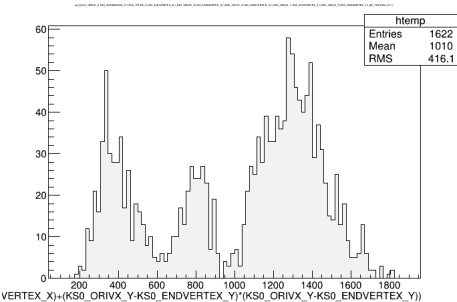


Truth Matched

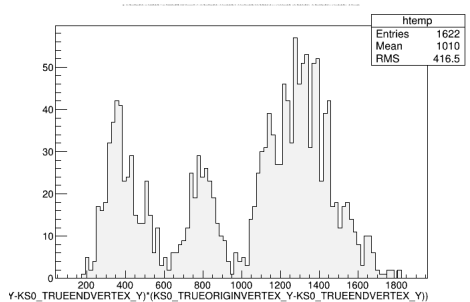


Flight distance of Inflaton, downstream μ

Reconstructed

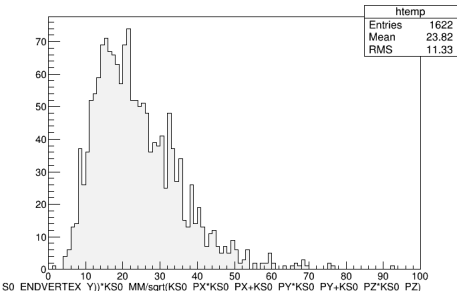


Truth Matched

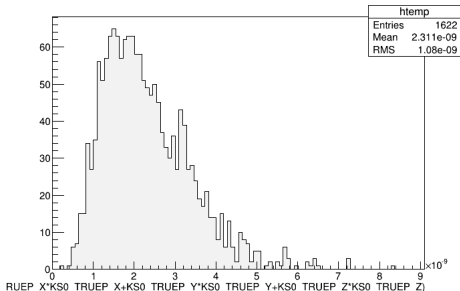


Life time of Inflaton, downstream μ

Reconstructed



Truth Matched



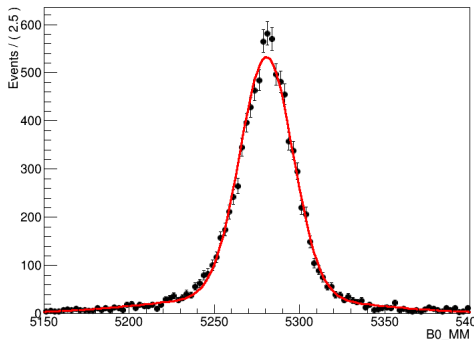
Mass Resolution

- Fitted separately for B^0 and χ
- Fitting model: Double Gauss.
- Single Gauss didn't work.
- We will account for MC/DATA difference.

Mass Resolution

StdMuons

A RooPlot of "B0_MM"

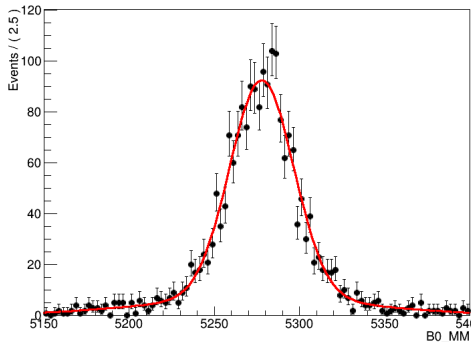


$$\begin{aligned} \text{mean}_1 &= 5.288 \times 10^{+03} \pm 0.21 \text{MeV}, \\ \text{mean}_2 &= 5.27 \times 10^{+03} \pm 1.56 \text{MeV} \\ \sigma_1 &= 58.8 \pm 2.24, \sigma_2 = 15.5 \pm 0.23 \end{aligned}$$

$$f = 0.79 \pm 0.01$$

Downstream

A RooPlot of "B0_MM"



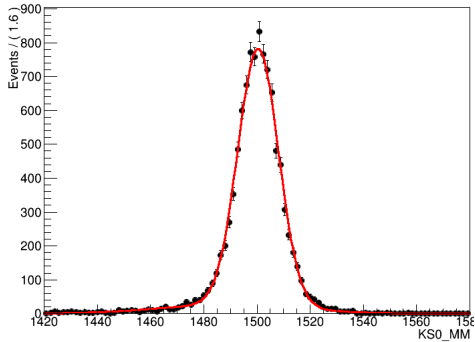
$$\begin{aligned} \text{mean}_1 &= 5.28 \times 10^{+03} \pm 4.18 \text{MeV}, \\ \text{mean}_2 &= 5.28 \times 10^{+03} \pm 0.56 \text{MeV} \\ \sigma_1 &= 66.6 \pm 7.56, \sigma_2 = 18.7 \pm 0.65 \end{aligned}$$

$$f = 0.21 \pm 0.02$$

Mass Resolution

StdMuons

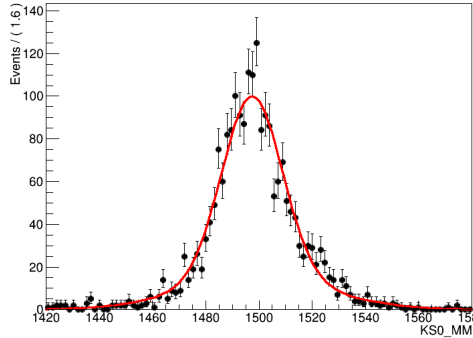
A RooPlot of "KS0_MM"



$$\begin{aligned} \text{mean}_1 &= 1.48893 \times 10^{+03} \pm 1.1 \text{MeV}, \\ \text{mean}_2 &= 1.50046 \times 10^{+03} \pm 0.09 \text{MeV} \\ \sigma_1 &= 25.7 \pm 0.83, \sigma_2 = 7.63 \pm 0.01 \\ f &= 0.104 \pm 0.007 \end{aligned}$$

Downstream

A RooPlot of "KS0_MM"



$$\begin{aligned} \text{mean}_1 &= 1.49880 \times 10^{+03} \pm 1.41 \text{MeV}, \\ \text{mean}_2 &= 1.49743 \times 10^{+03} \pm 0.51 \text{MeV} \\ \sigma_1 &= 27.3 \pm 2.57, \sigma_2 = 11.34 \pm 0.88 \\ f &= 0.28 \pm 0.075 \end{aligned}$$

Summary on inflaton

- Good reconstruction of life time. 😊
- Excellent mass resolution. 😊
- Data from 2011 and 2012 are being processing with our preselection on DIRAC as we speak. 😊
- Poor efficiency: $\varepsilon_{rex} \times \varepsilon_{stripping} = 1\%$ 😞
- Need to investigate if this is due to reco or stripping.