

Cut studies

Abdulla Abdussalam

Vineet Kumar

Prashant Shukla

BARC, Mumbai

Introduction

> We try to comment on the Documentation for cut studies

<https://twiki.cern.ch/twiki/pub/Main/CutStudies/JPsiLat.pdf>

---> Jpsi mass window(2.6,3.5) is fitting range and ± 2 sigma is used for signal integration

---> Figure of Merit (Significance) = $n_{\text{Signal}} / \sqrt{(n_{\text{Signal}} + n_{\text{Bkg}})}$

> In this study, we measured efficiency at each cut variable and at All cut with MC and data.

For MC we used

OniaToMuMuSkim data for J/Psi sample
skimmed with the Onia2MuMu analyzer

Run on data

/castor/cern.ch/cms/store/caf/user/tdahms/HeavyIons/Onia/Data2010/v4/Skims/Prompt/150256-150619/

/castor/cern.ch/cms/store/caf/user/tdahms/HeavyIons/Onia/Data2010/v4/Skims/Prompt/150844-153368/

Efficiency for Signal and Background rejection-MC

Cut Variable	Efficiency $ y < 1.2$	Efficiency $1.2 < y < 1.6$	Efficiency $1.6 < y < 2.4$
muInnerTrackHits > 10	signal 100	signal 100	signal 100
	RejBkg 0.21	RejBkg 0	RejBkg 0
muPixeLayers > 0	signal 100	signal 100	signal 100
	RejBkg 0.21	RejBkg 0	RejBkg 0
muInnerTrackChi2NDOF < 2.0	signal 97.7	signal 98.9	signal 100
	RejBkg 0	RejBkg 0.49	RejBkg 18.6
muDxy < 1. cm	signal 100	signal 100	signal 100
	RejBkg 0.21	RejBkg 0	RejBkg 0
muDz < 15. cm	signal 100	signal 100	signal 100
	RejBkg 0.21	RejBkg 0	RejBkg 0
muGlobalTrackChi2NDOF < 20	signal 98.8	signal 100	signal 98.8
	RejBkg 1.65	RejBkg 0	RejBkg 0
muValidMuHits > 0	signal 96.2	signal 95.9	signal 96.5
	RejBkg 16.9	RejBkg 4.14	RejBkg 5.89
vProb > 0.01	signal 99.1	signal 98.3	signal 98.3
	RejBkg 9.4	RejBkg 1.4	RejBkg 22.9
All cut	signal 92.2	signal 93.2	signal 93.8
	RejBkg 21.3	RejBkg 6.15	RejBkg 27.7

- Efficiency at each cut variable
- Large reduction in signal at mu_ValidMuHits
- At All cut 92-93% signal can be kept.

Efficiency for Signal and Background rejection-data

Cut Variable	Efficiency $ y < 1.2$	Efficiency $1.2 < y < 1.6$	Efficiency $1.6 < y < 2.4$
$\text{muInnerTrackHits} > 10$	signal 100 RejBkg 0	signal 100 RejBkg 0	signal 100 RejBkg 0
$\text{muPixeLayers} > 0$	signal 100 RejBkg 0	signal 100 RejBkg 0	signal 100 RejBkg 0
$\text{muInnerTrackChi2NDOF} < 2.0$	signal 98.6 RejBkg 10.5	signal 99.7 RejBkg 13.9	signal 94.8 RejBkg 12.6
$\text{muDxy} < 1. \text{ cm}$	signal 100 RejBkg 0	signal 100 RejBkg 0	signal 100 RejBkg 0
$\text{muDz} < 15. \text{ cm}$	signal 100 RejBkg 0	signal 100 RejBkg 0	signal 100 RejBkg 0
$\text{muGlobalTrackChi2NDOF} < 20$	signal 97.9 RejBkg 6.5	signal 92.0 RejBkg 6.1	signal 95.6 RejBkg 0.55
$\text{muValidMuHits} > 0$	signal 93.7 RejBkg 36.6	signal 84.2 RejBkg 40.4	signal 78.0 RejBkg 51.6
$\text{vProb} > 0.01$	signal 98.4 RejBkg 17.4	signal 90.1 RejBkg 9.8	signal 100 RejBkg 11.5
All cut	signal 87.4 RejBkg 55.7	signal 71.0 RejBkg 58.6	signal 74.4 RejBkg 63.0

- Large reduction in the efficiency at $\text{mu_GlobalTrackChi2NDOF}$ and at mu_ValidMuHits .

Summary and Plan

- > After applying all cuts, 92-93% signal could be kept with MC.
- > We will update the analysis note according the comments.