

$\tau \rightarrow \gamma\mu$  at STCF

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# Double Tag

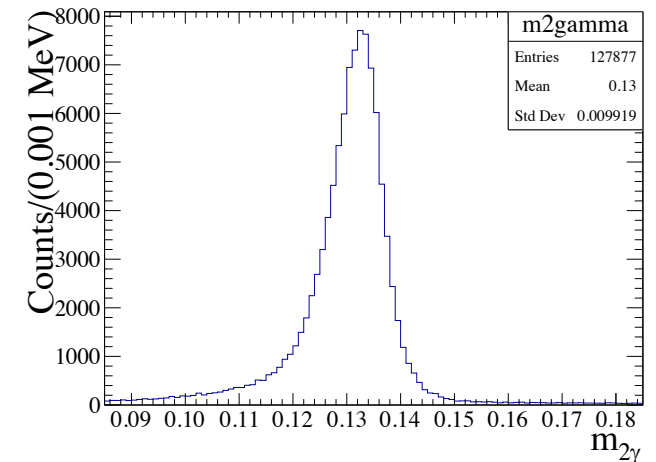
- signal side:  $\tau^- \rightarrow \gamma\mu^-$
- tag side:  $\tau^+$ 
  - $e^+\nu_e\bar{\nu}_\tau$
  - $\mu^+\nu_\mu\bar{\nu}_\tau$
  - $\pi^+\bar{\nu}_\tau$
  - $\pi^+\pi^0\bar{\nu}_\tau$
  - $\pi^+\pi^0\pi^0\bar{\nu}_\tau$
  - total tag efficiency 80.78%

# Initial Event Selection

- Good charged tracks
  - $n_{\text{Good}} = 2$ ,  $n_{\text{Charge}} = 0$
- Good photons
  - $n_{\text{Gamma}} \geq 1$
  - Reconstruct  $\pi^0$  (see next page)
  - # of gamma left = 1 (signal gamma)
  - $E_{\text{gamma,sig}}$  in  $[0.4, 1.6]$  GeV
- PID
  - $N(\mu^-) = 1$   
 $N(e^+) + N(\mu^+) + N(\pi^+) = 1$

# Reconstruct $\pi^0$

- determine mass window
  - for every combination of 2 gammas from signal MC, sort them according to the difference between its invariant mass and  $\pi^0$  mass
  - select combinations according to number of  $\pi^0$  from MC truth
  - mass window: [0.12 GeV, 0.14 GeV]
- Reconstruct  $\pi^0$ 
  - for every combination of 2 gammas, sort them according to the difference between its invariant mass and  $\pi^0$  mass
  - select all combinations within mass window
  - signal gamma will be chosen from remaining gammas

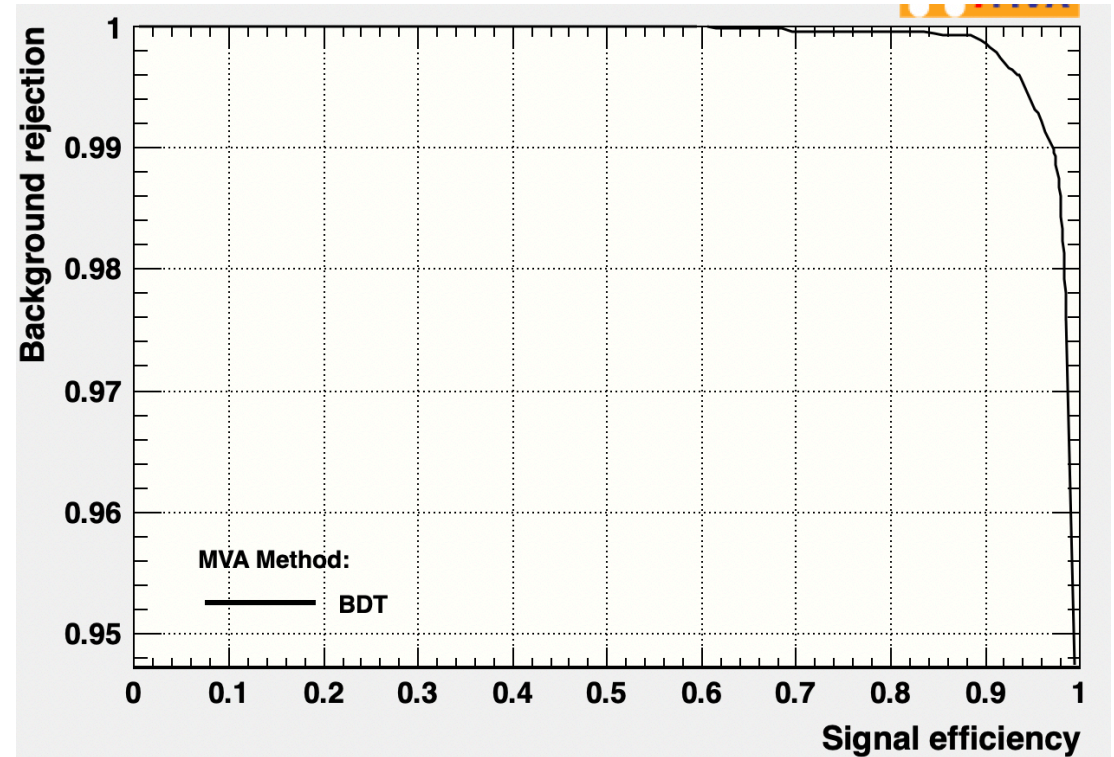
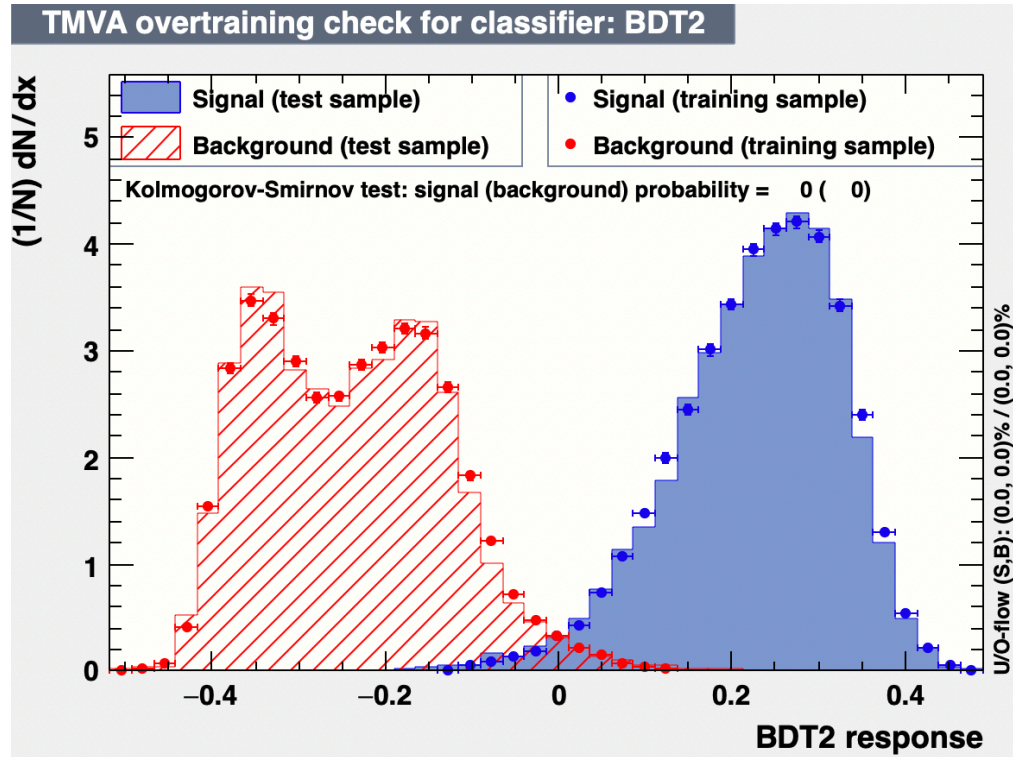


# BDT

- inputs:
  - p of tracks
  - $\cos\theta$  between signal and tag tracks
  - p\_miss, m\_miss, m\_signal



# BDT Train



# BDT Application

