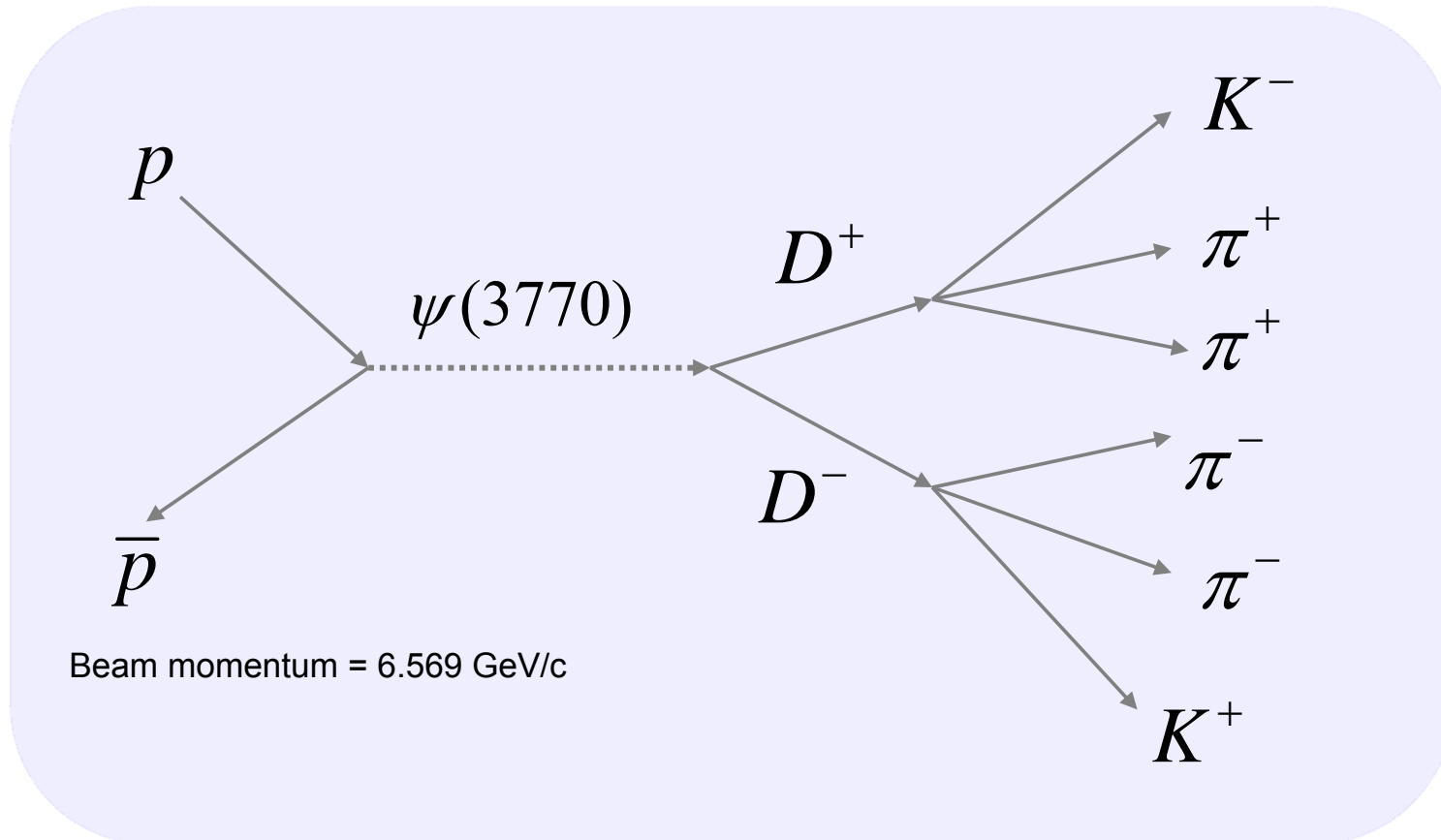


# Fast simulation for $\psi(3770)$ event

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Physics channel :  $\bar{p}p \rightarrow \psi(3770) \rightarrow D^+D^- \rightarrow K^-\pi^+\pi^+K^+\pi^-\pi^-$



Best benchmark channel for the testing of tracking performance and acceptance

# Status of fast simulation

- Found few bugs in scrut14 and fixed now

GEM recohits (Full, Fast)

Forward spectrometer (Fast)

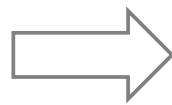
EMC neutral covariant matrix (Fast)

- MC simulation have to be reproduced according to update

- Efficiency looks similar after update & tuning of tracking efficiency in fast sim.

Fast eff.(D+/-) = 0.67

Full eff. (D+/-) = 0.30



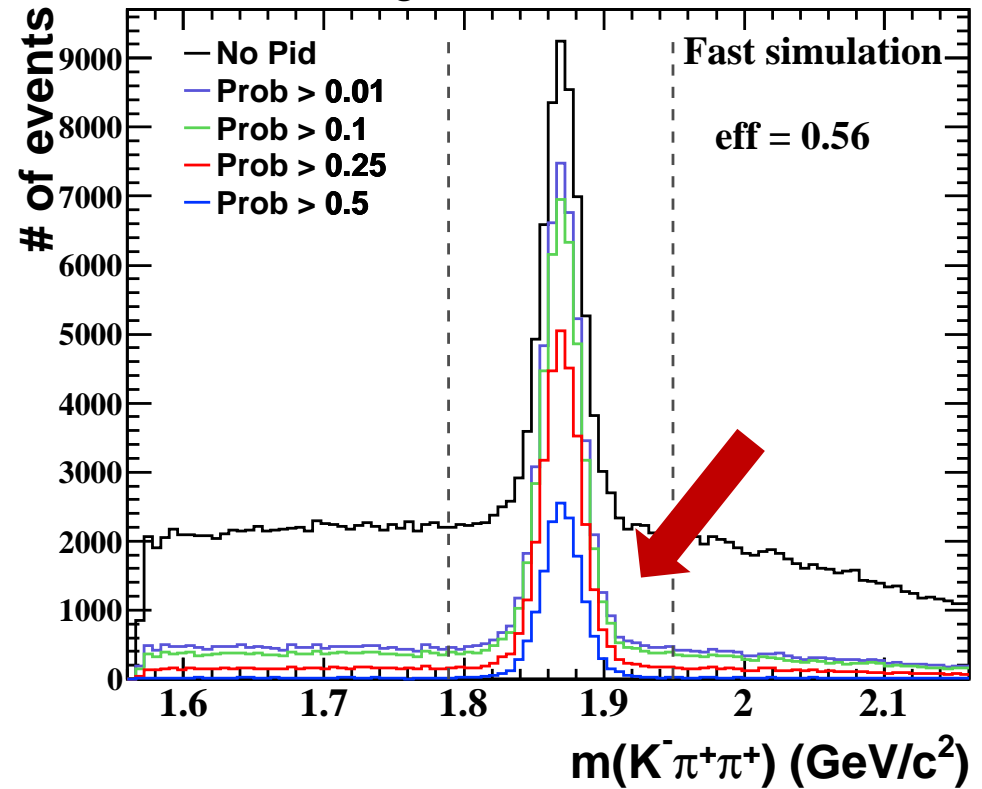
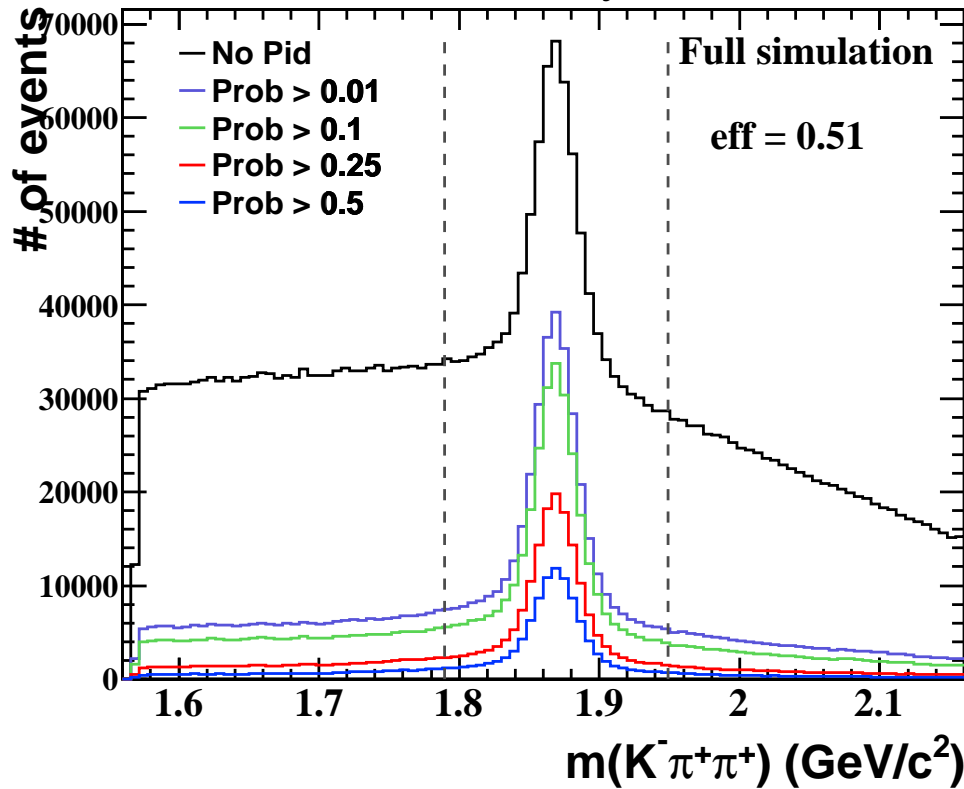
Fast eff.(D+/-) = 0.56

Full eff. (D+/-) = 0.51

# Full vs Fast

PID efficiency in each PID detector : 1.0  $\rightarrow$  0.7

efficiency = reconstructed within mass window / generated



- PID probability in the fast simulation is too good
- require also an adjustment of tuning parameter for PID part
- not easy to control PID  $\rightarrow$  need discussion with scrutiny group

# Few reference plots from full simulation

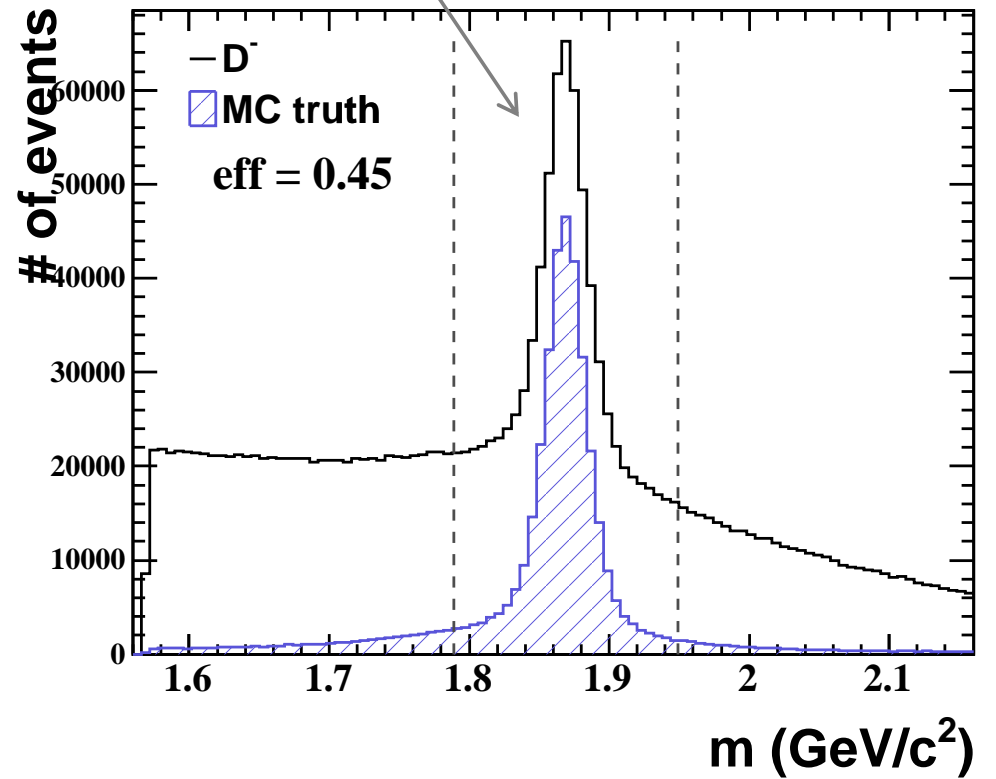
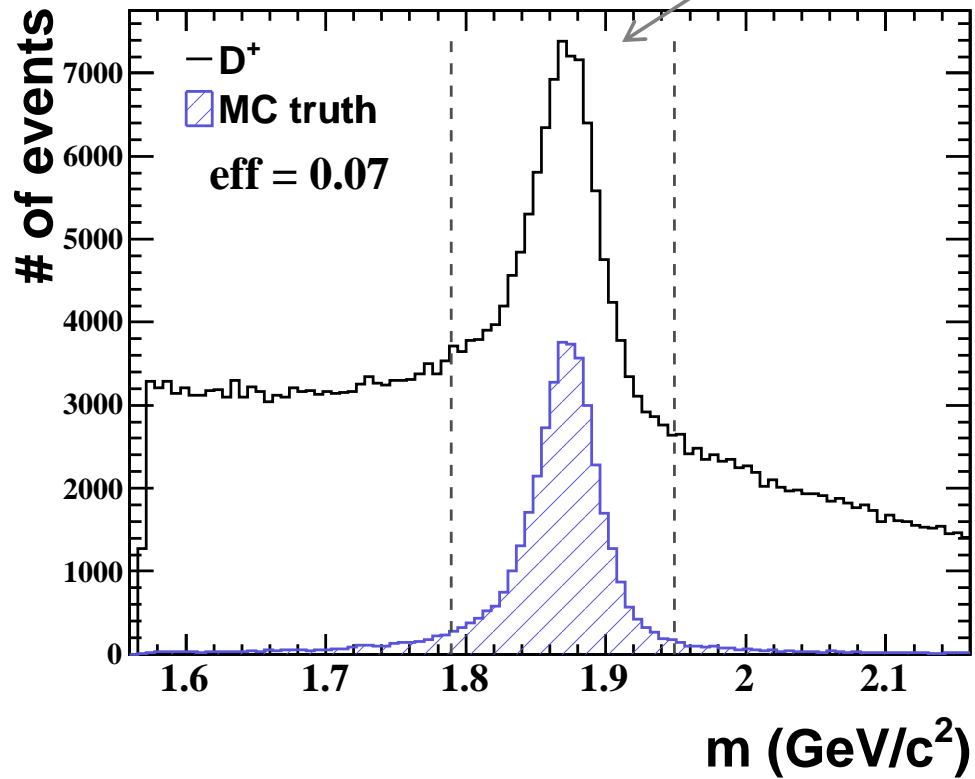
$$\begin{aligned} \bar{p}p &\rightarrow \psi(3770) \rightarrow D^+ D^- \rightarrow K^- \pi^+ \pi^+ K^+ \pi^- \pi^- & @\bar{p} = 6.57 \text{ GeV}/c \\ \bar{p}p &\rightarrow \psi(3770) \rightarrow D^+ D^- \rightarrow K_s^0 \pi^+ \pi^0 K^+ \pi^- \pi^- \end{aligned}$$

$$\begin{aligned} \bar{p}p &\rightarrow \psi(3770) \rightarrow D^0 \bar{D}^0 \rightarrow K_s^0 \pi^+ \pi^- K^+ \pi^- & @\bar{p} = 6.57 \text{ GeV}/c \\ \bar{p}p &\rightarrow \psi(3770) \rightarrow D^0 \bar{D}^0 \rightarrow \gamma \gamma K^+ \pi^- \\ \bar{p}p &\rightarrow \psi(3770) \rightarrow D^0 \bar{D}^0 \rightarrow \mu^+ \mu^- K^+ \pi^- \end{aligned}$$

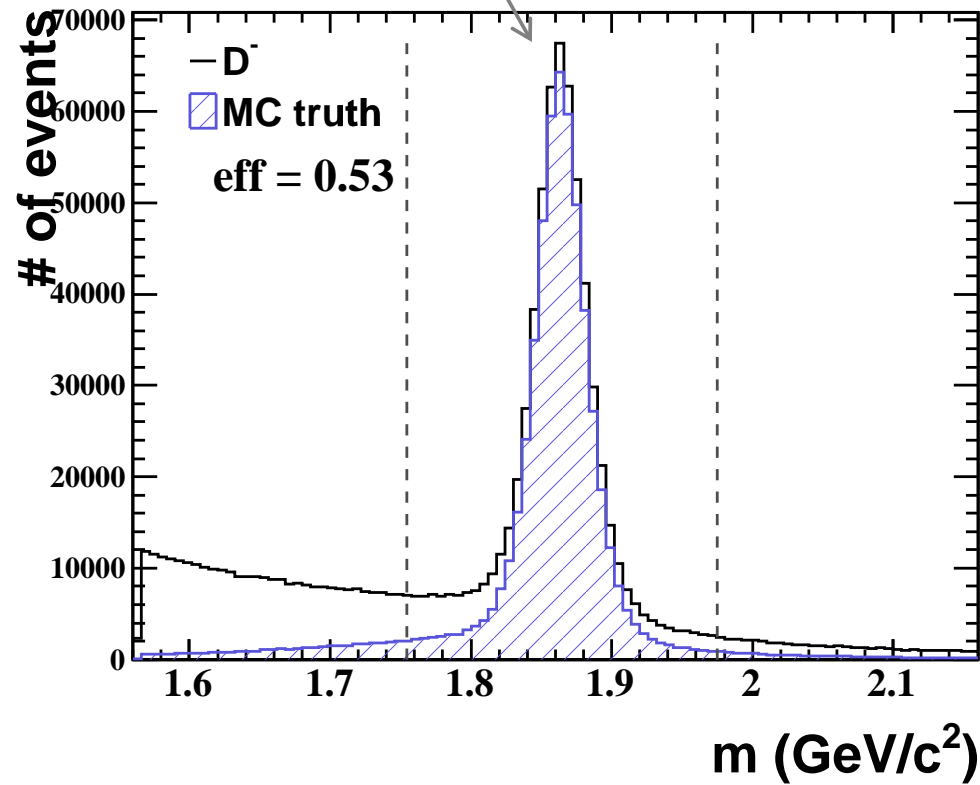
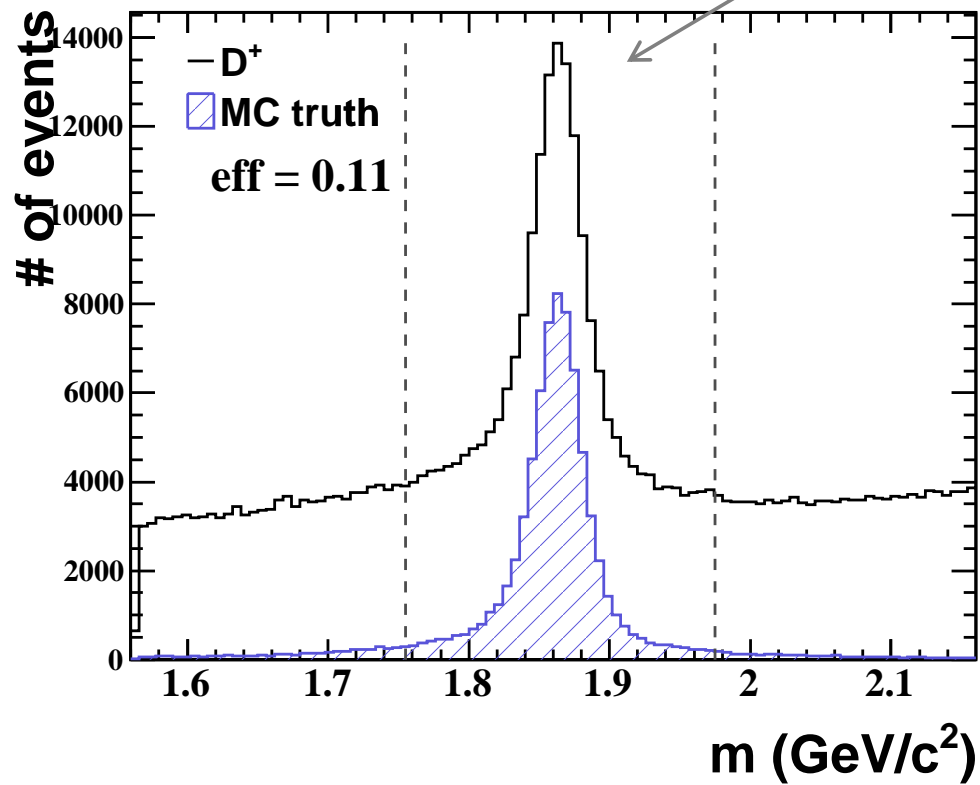
$$\begin{aligned} \bar{p}p &\rightarrow \Lambda_c^+ \Lambda_c^- \rightarrow p \gamma \bar{p} K^+ \pi^- & @\bar{p} = 13.6 \text{ GeV}/c \\ \bar{p}p &\rightarrow \Lambda_c^+(2940) \Lambda_c^- \rightarrow p D^0 \bar{p} K^+ \pi^- \rightarrow p K^- \pi^+ \bar{p} K^+ \pi^- \end{aligned}$$

- evt.pdl and DECAY.DEC has been modified :  $\Lambda_c(2940)$  and  $D^0(\gamma\gamma)$
- 3-Body decay with Dalitz mode in D meson / phase space mode for  $\Lambda_c$
- 1 M events / channel

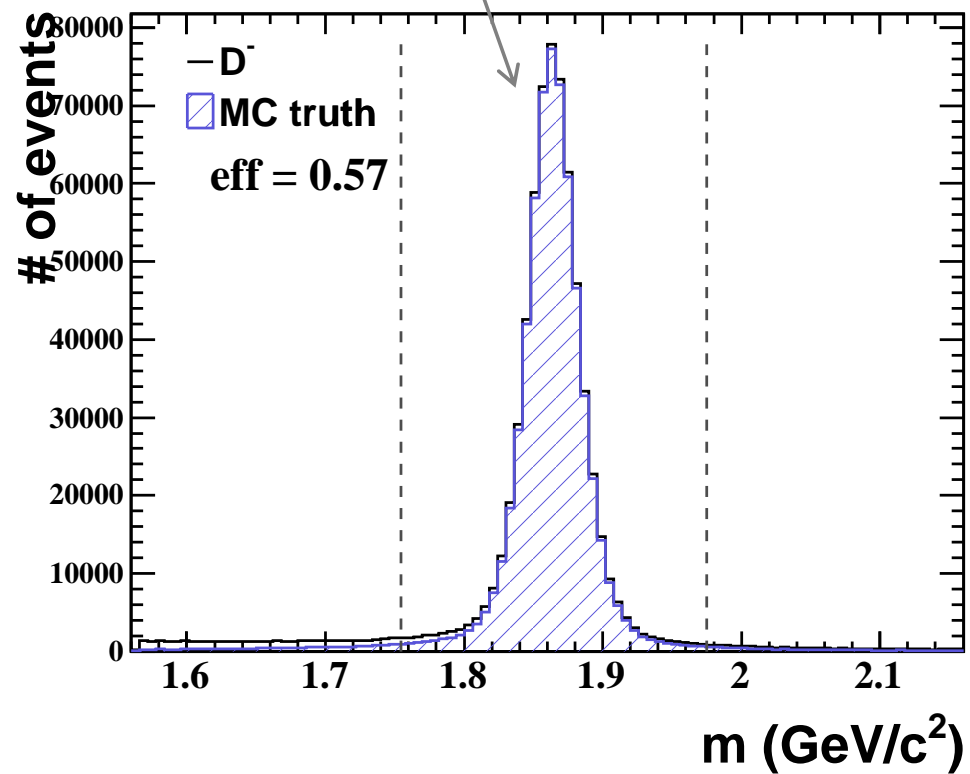
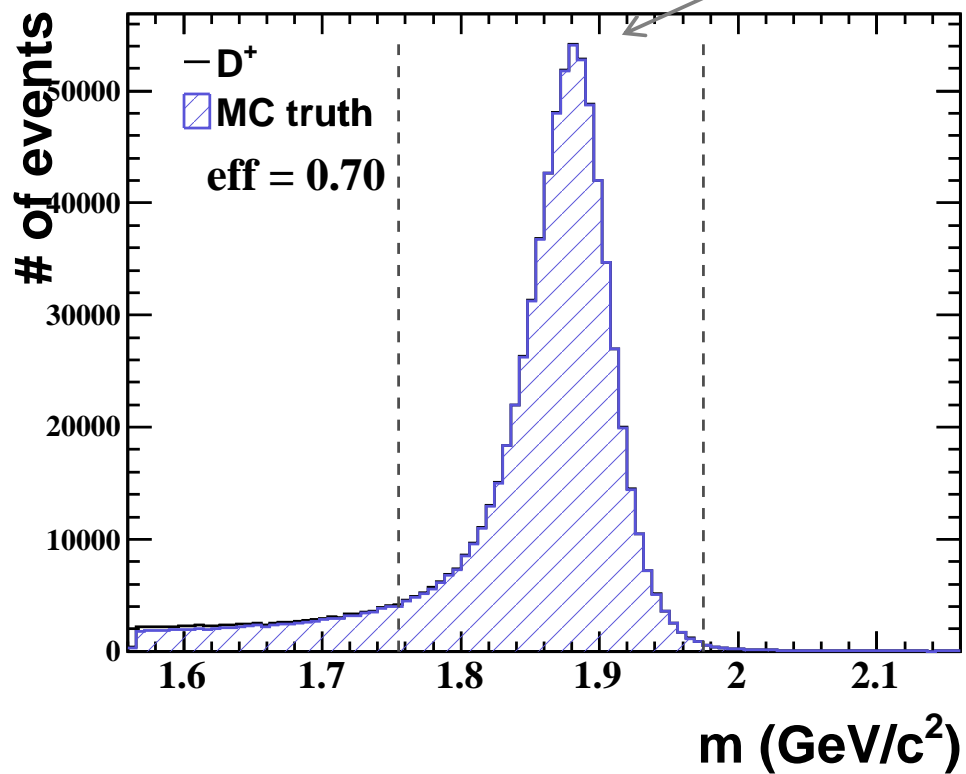
$$\bar{p}p \rightarrow \psi(3770) \rightarrow D^+ D^- \rightarrow \left[ K_s^0 \pi^+ \pi^0 \right] \left[ K^+ \pi^- \pi^- \right]$$



$$\bar{p}p \rightarrow \psi(3770) \rightarrow D^0 \bar{D}^0 \rightarrow \begin{array}{|c|c|} \hline K_s^0 \pi^+ \pi^- & K^+ \pi^- \\ \hline \end{array}$$

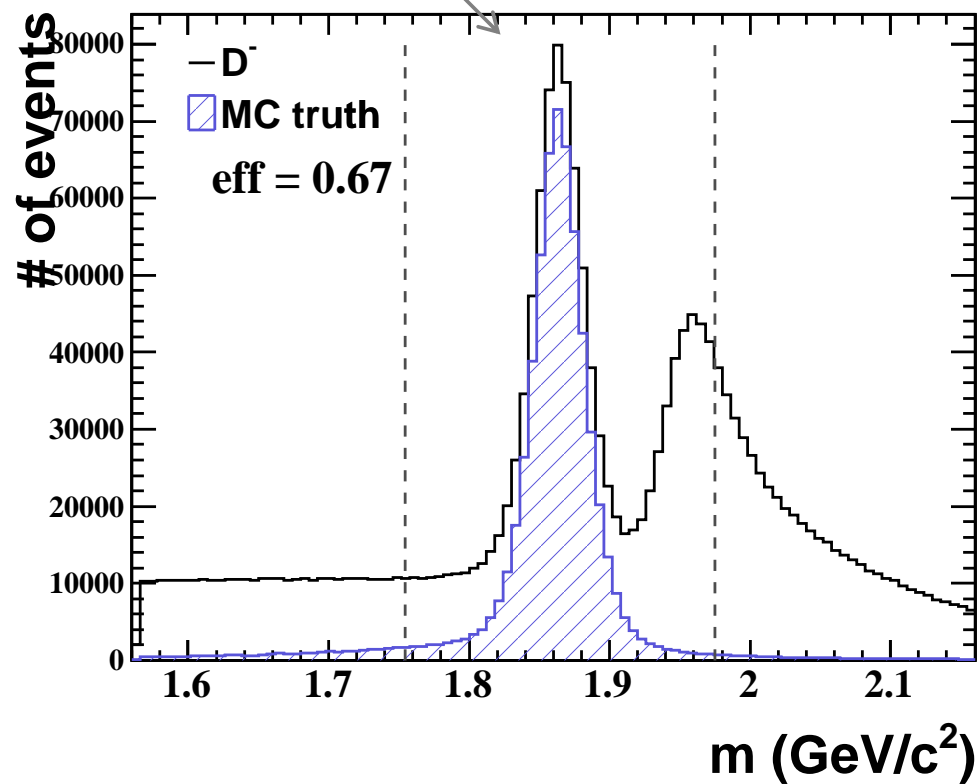
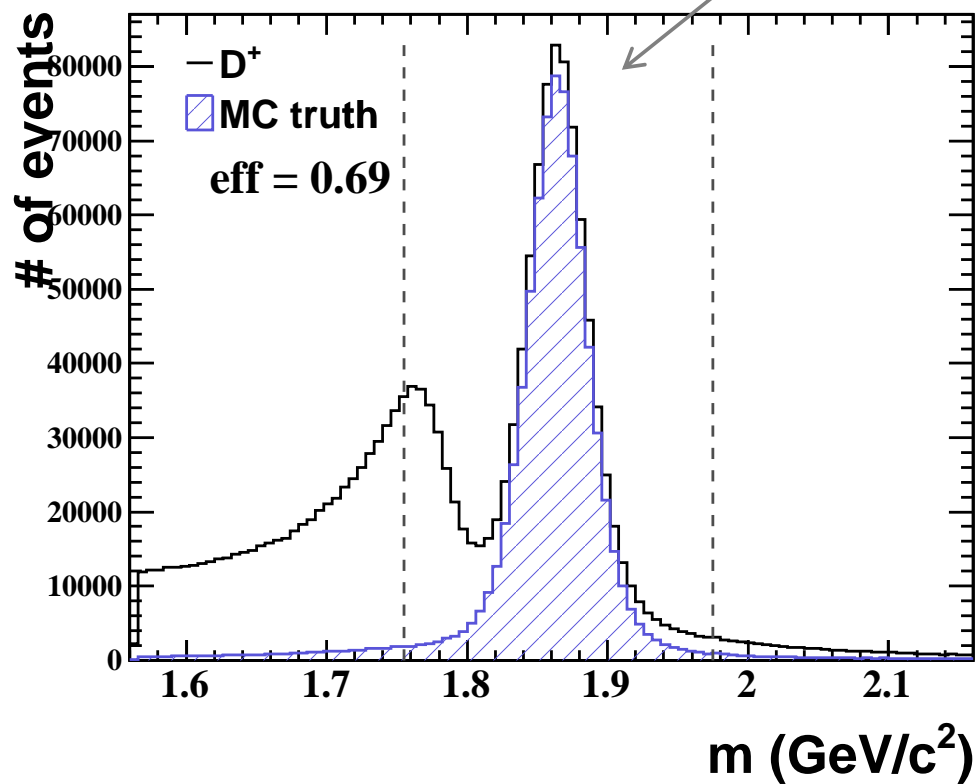


$$\bar{p}p \rightarrow \psi(3770) \rightarrow D^0 \bar{D}^0 \rightarrow \gamma \gamma \quad K^+ \pi^-$$

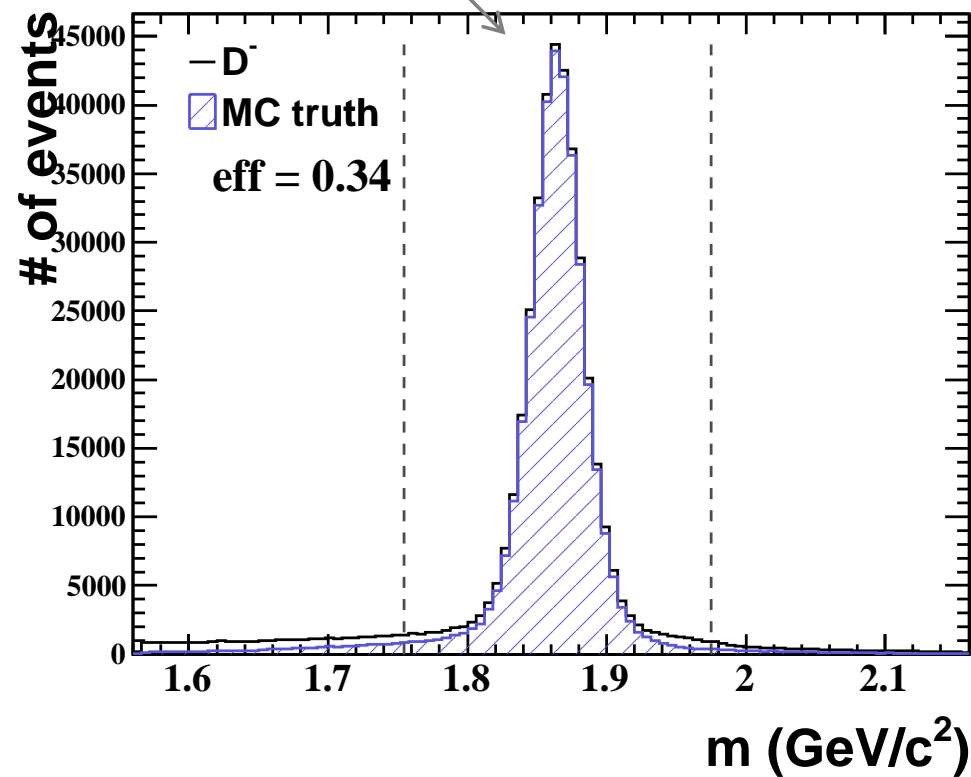
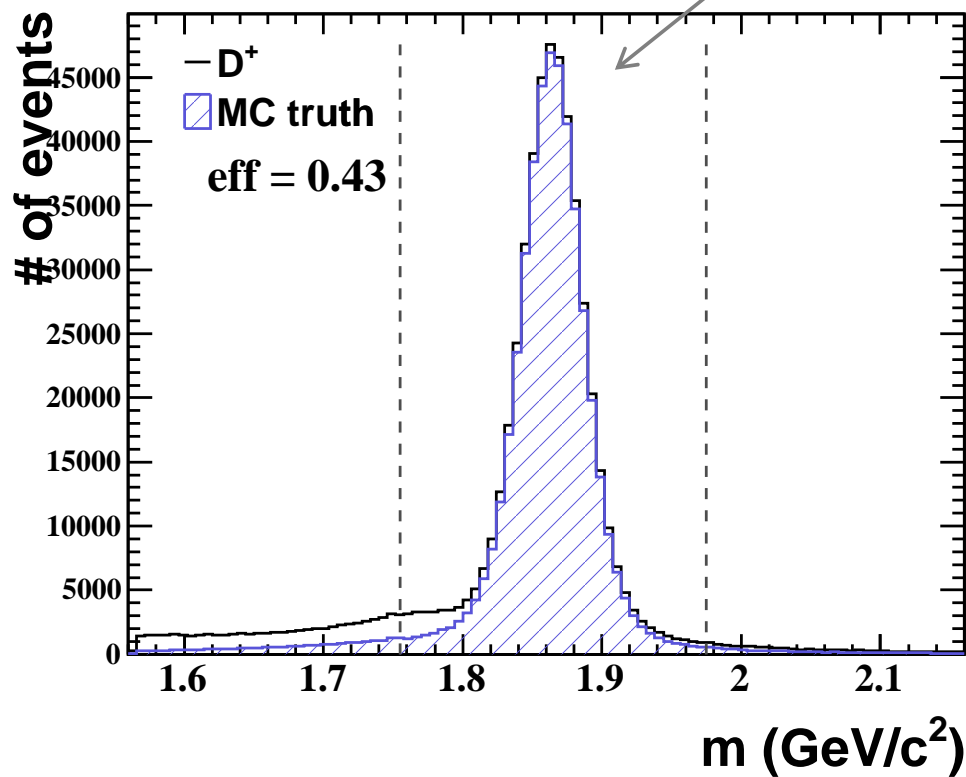




$$\bar{p}p \rightarrow \psi(3770) \rightarrow D^0 \bar{D}^0 \rightarrow \mu^+ \mu^- K^+ \pi^-$$



$\bar{p}p \rightarrow \psi(3770) \rightarrow D^0 \bar{D}^0 \rightarrow \mu^+ \mu^- K^+ \pi^-$



PID probability  $> 0.25$

