Update on $D_s^{**+} \rightarrow D^0 K^+$

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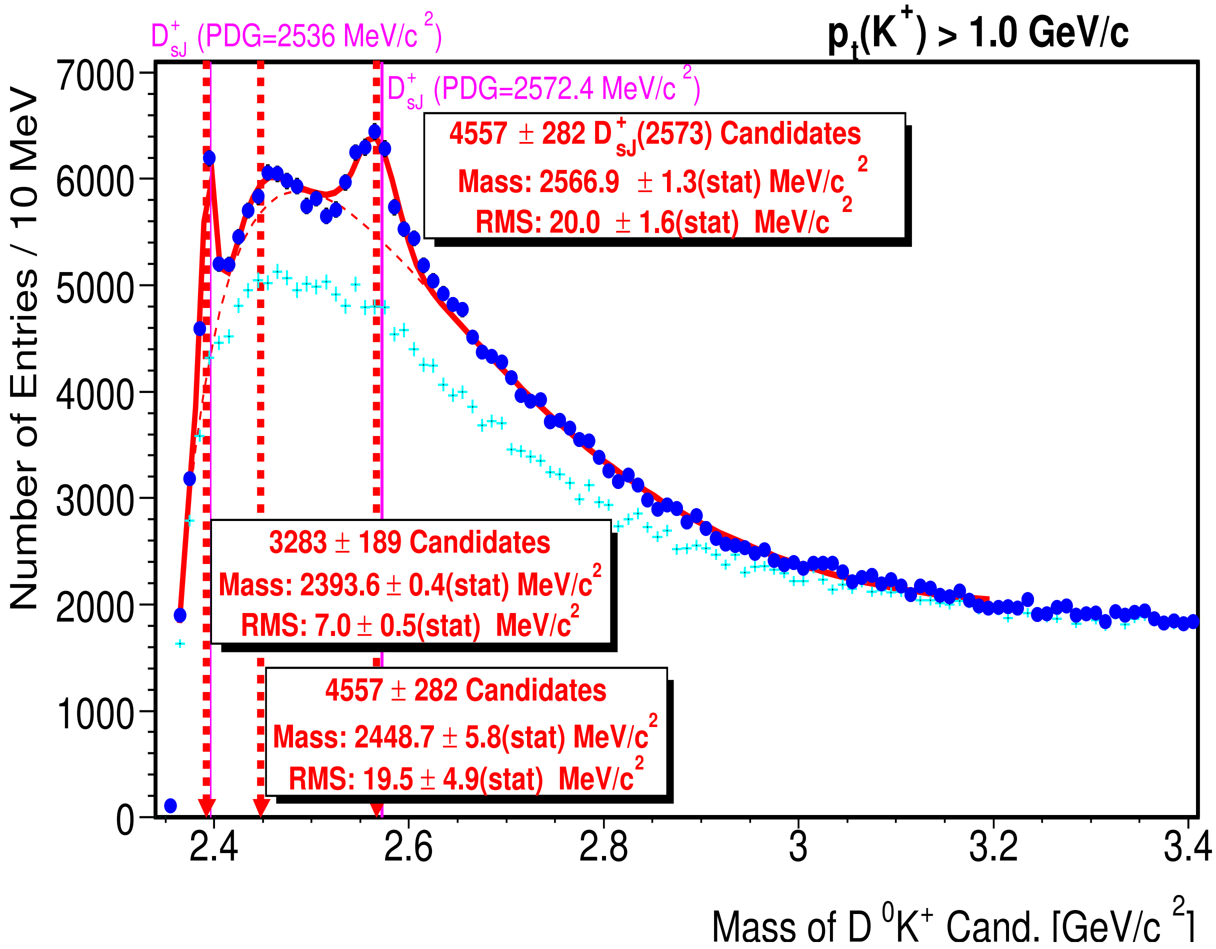
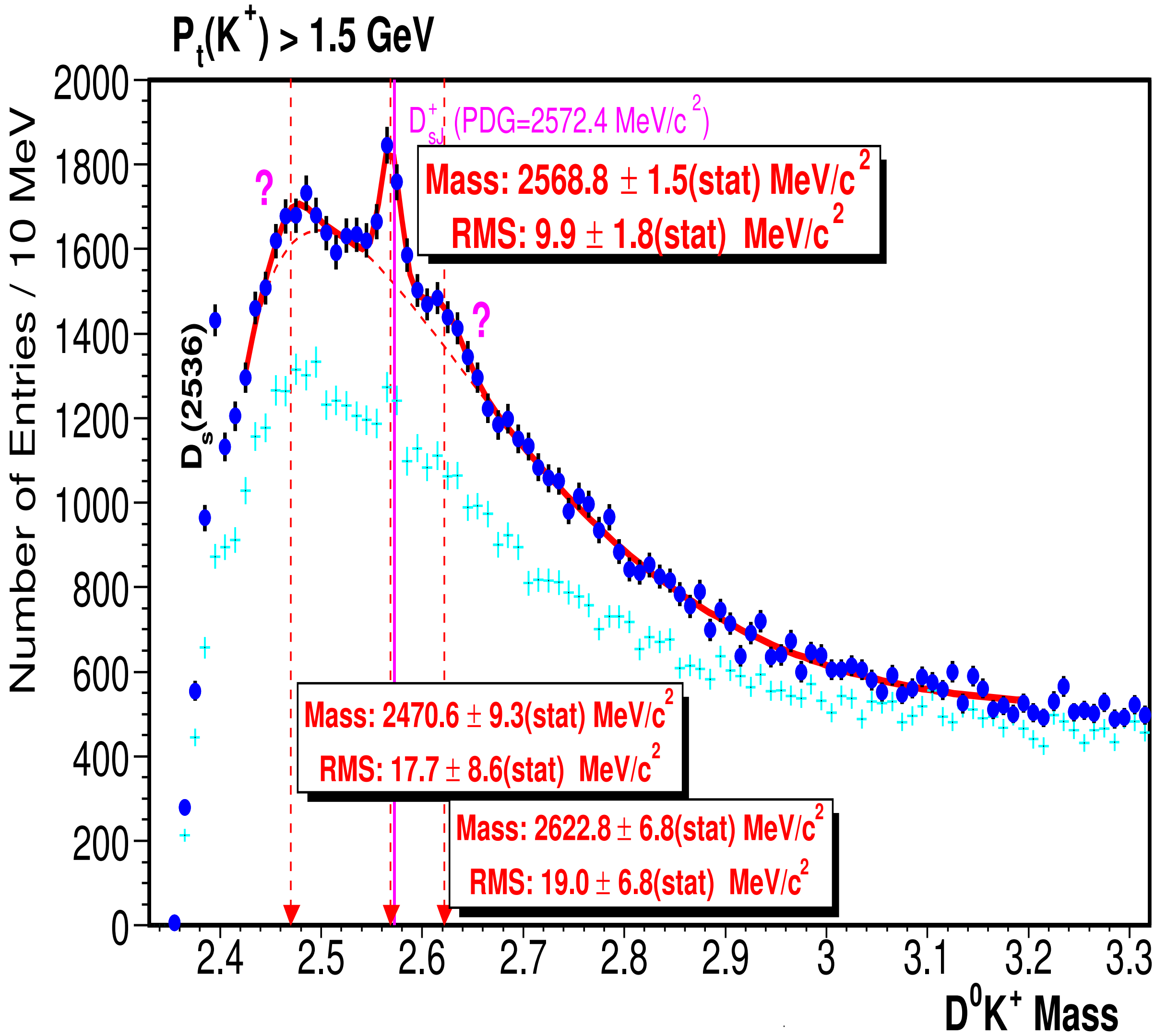
- Previous Mass Distributions
- Reflections Studies
- Some Signal Clean-Up
- MC Plans

Previously:



- **Clear** $D_{sJ}(2573) \to D^0 K^+$
- **Pretty Clear** $D_{sJ}(2536) \to D^{*0} K^+$
  $\to D^0 K^+ (\pi^0/\gamma)_{lost}$
- **A Mystery Bump Around 2470 MeV**
- **Small Excess Around 2620 MeV**

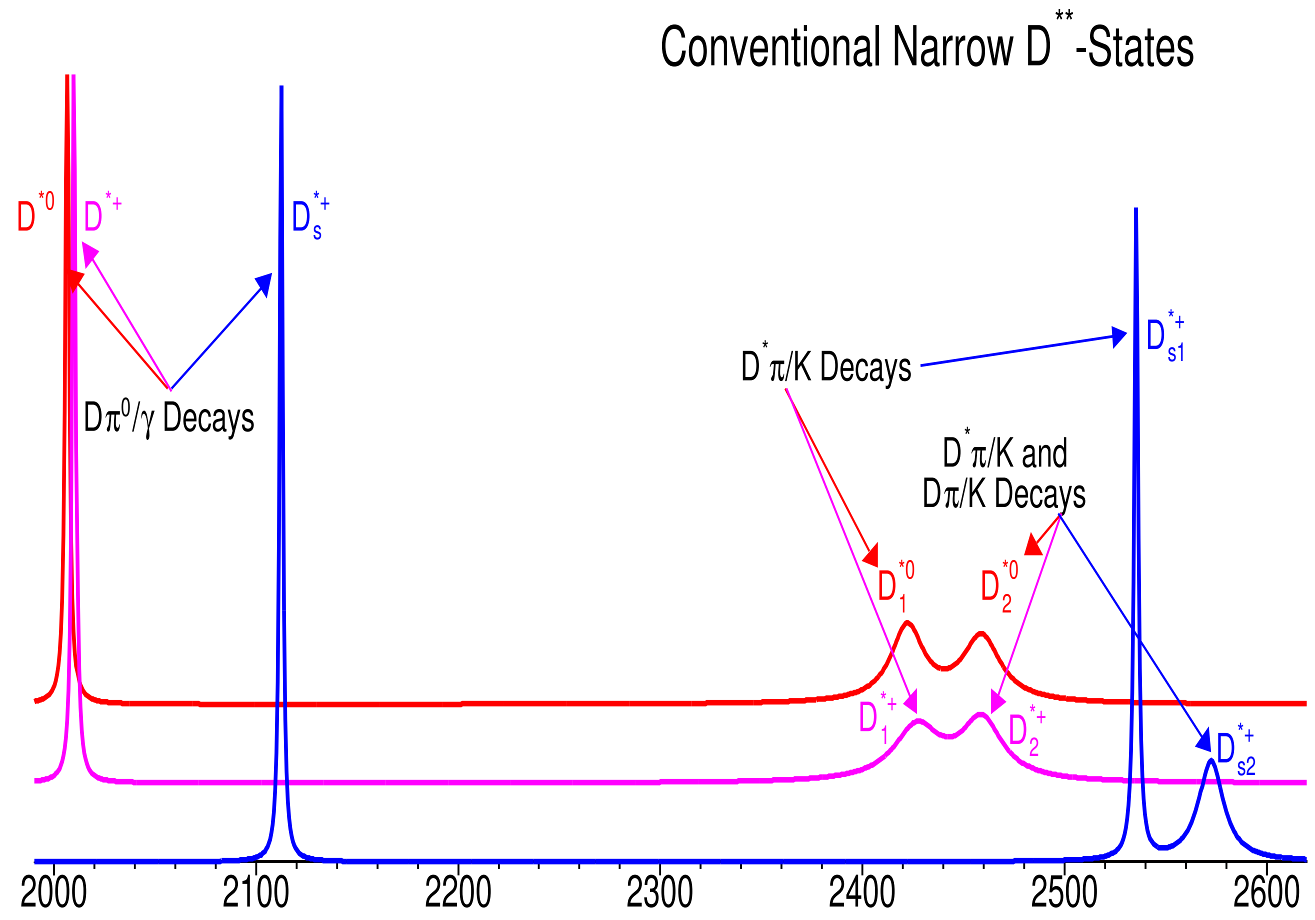
Originally :*



- *Excess Around 2620 MeV More Pronounced*

* *"Original" Selection Based on "Prompt" Cuts Involving L_{xy}, & Subsequently Abandoned*

D^{**} Geography:



Important Distinction:

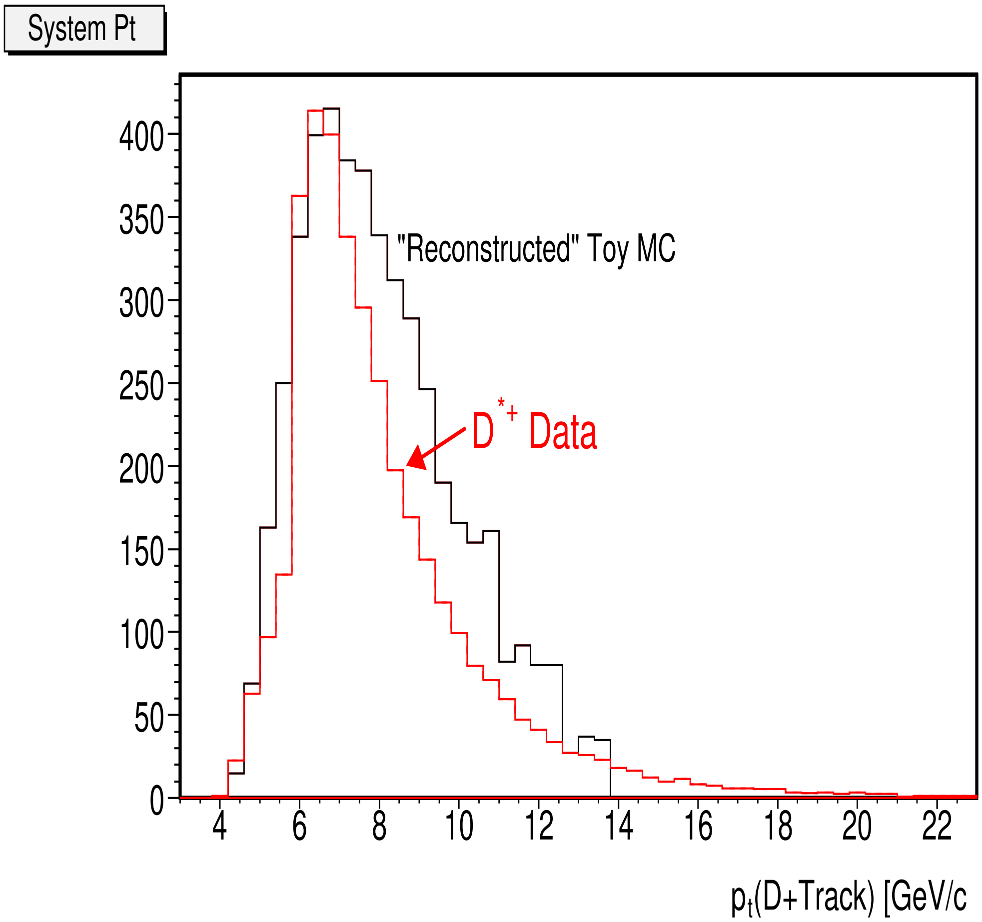
- **Direct Decays:** $D_s^{**} \to D^0 K^+$
- **Indirect Decays:** $D_s^{**} \to D^* K^+$
  $\Longrightarrow$ **Lost π's or γ's**

Reflections Studies:

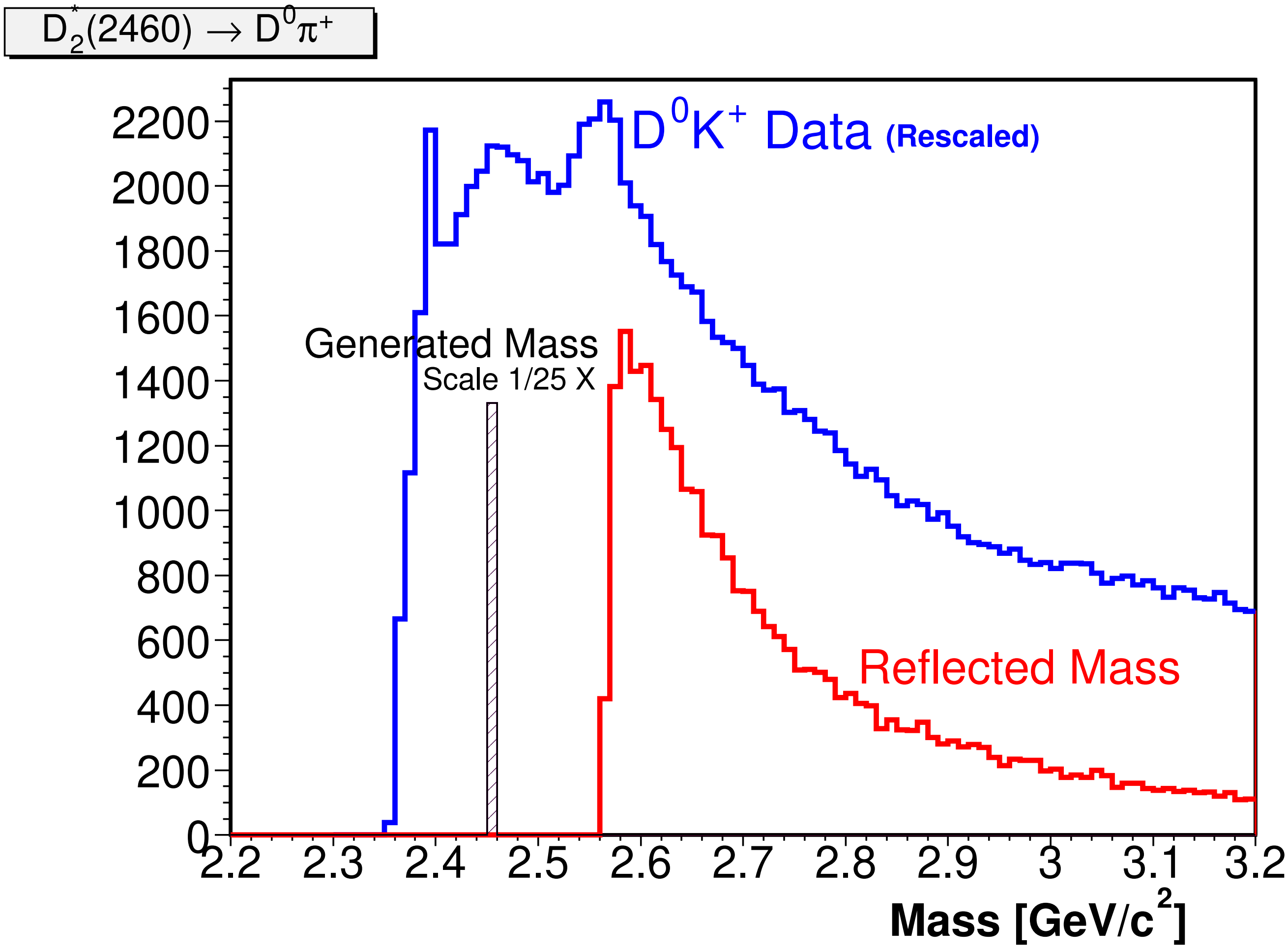
- Made Toy MC to Calculate Reflected Masses
- Generate p_t by Fudging Measured D^* Dist.
- Require 2 “Trigger Tracks” with $p_t > 1.95$ GeV
- No Impact Parameter Simulation
- No Resolution Smearing
- No Spin Correlations

—- *Quick & Easy Way to Experiment* —-

e.g.



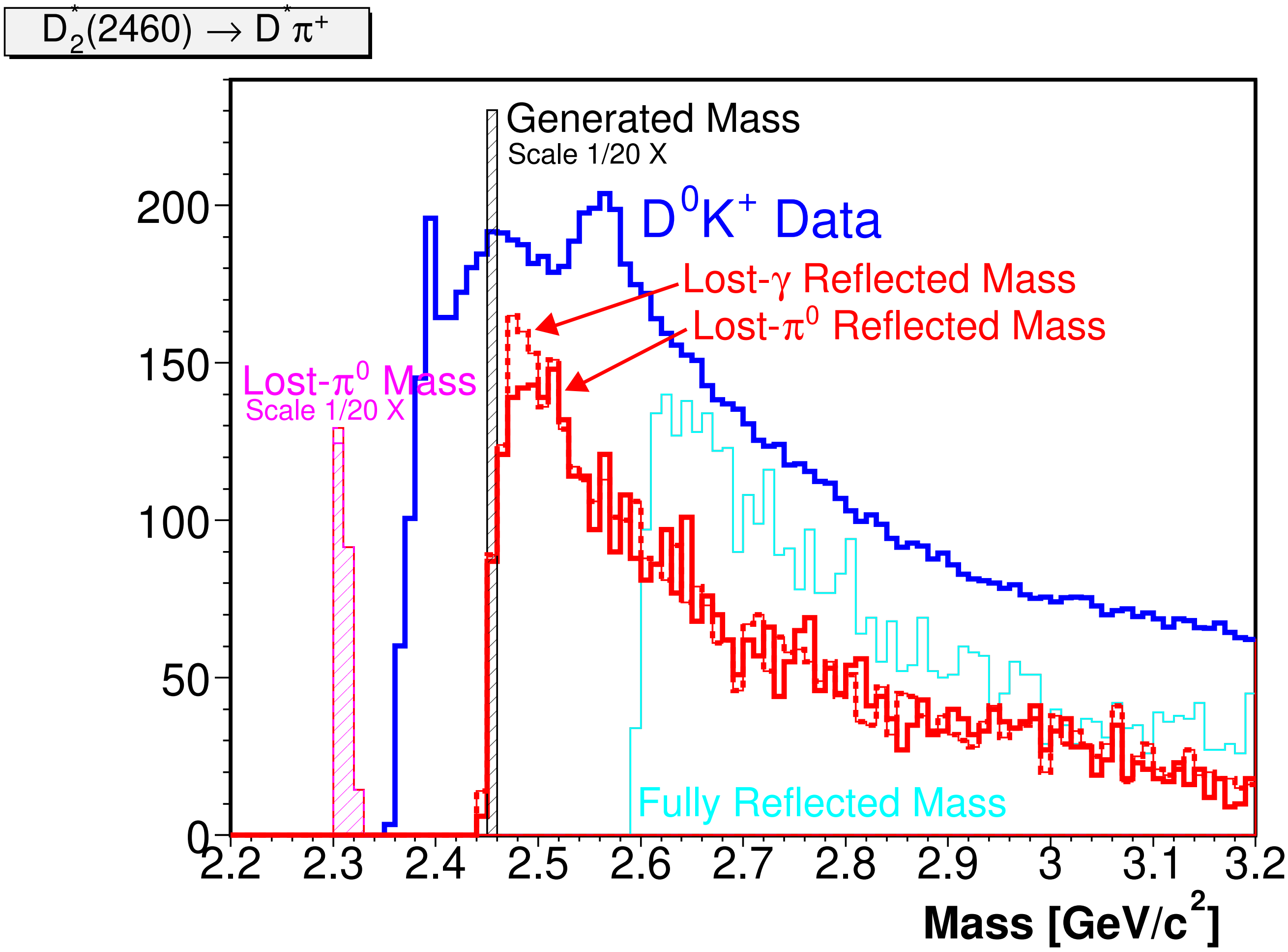
D^0K^+ Reflection from $D_2(2460) \to D^0\pi^+$:



- **Broad Excess Around 2.6 GeV**
  —Just Above $D_{sJ}(2573)^+ \to D^0K^+$

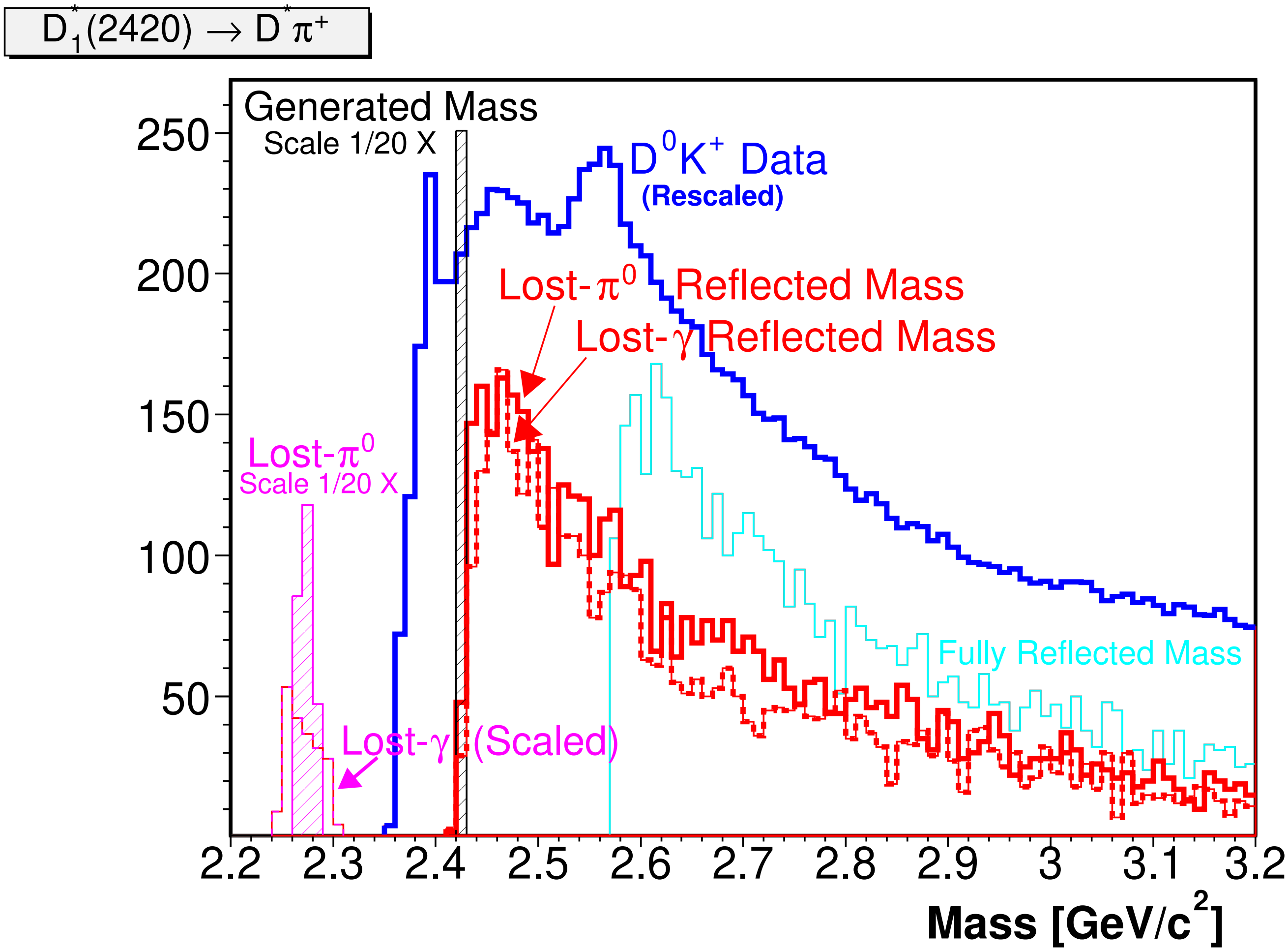
NOTE: *Data Arbitrarily Rescaled in Plot*

D^0K^+ Reflection from $D_2(2460) \rightarrow D^*\pi^+$:



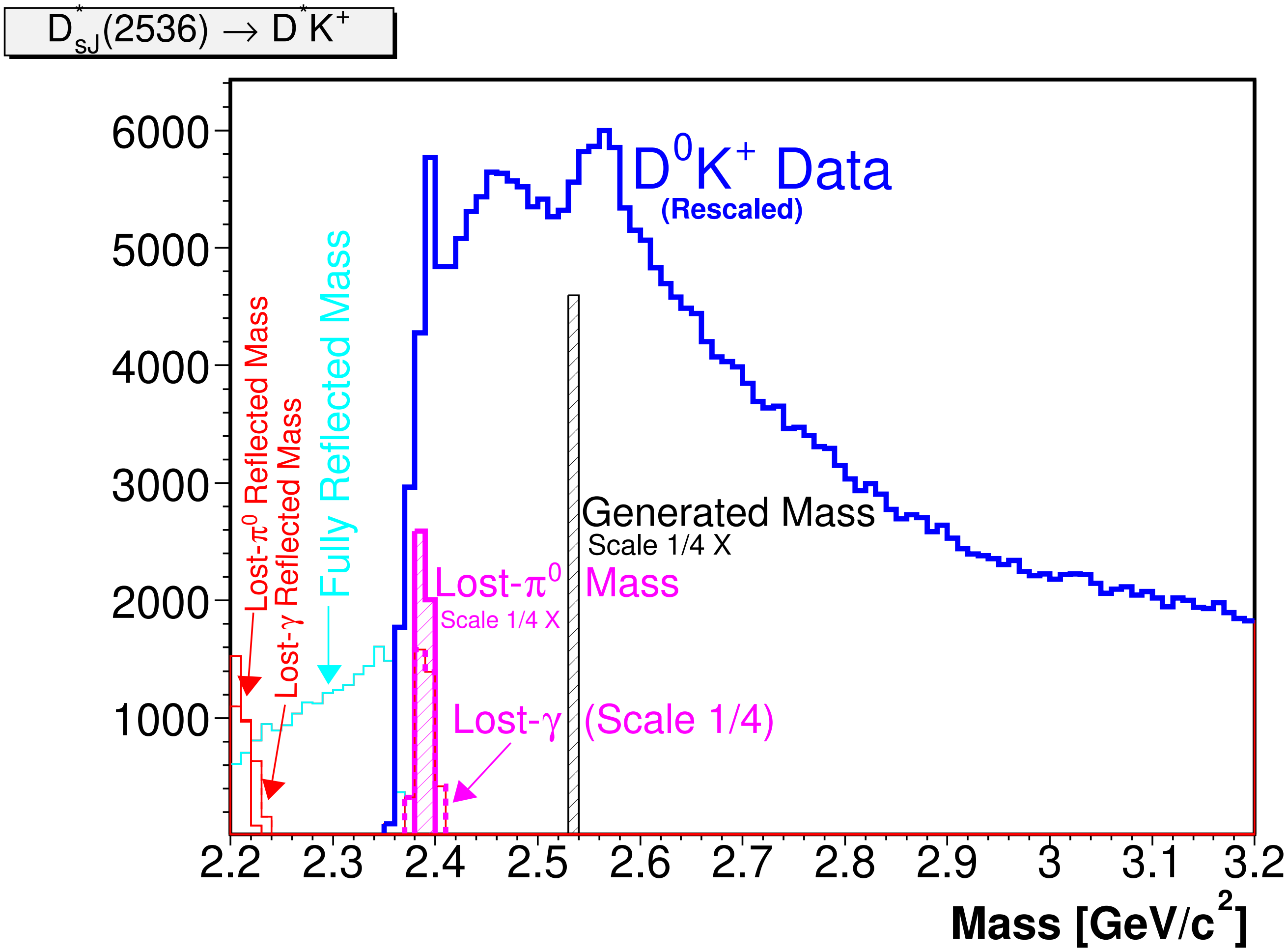
- **Excess Collecting Around 2.47 GeV**
  —Upper Half of "Mystery Bump"

D^0K^+ Reflection from $D_1(2420) \rightarrow D^*\pi^+$:



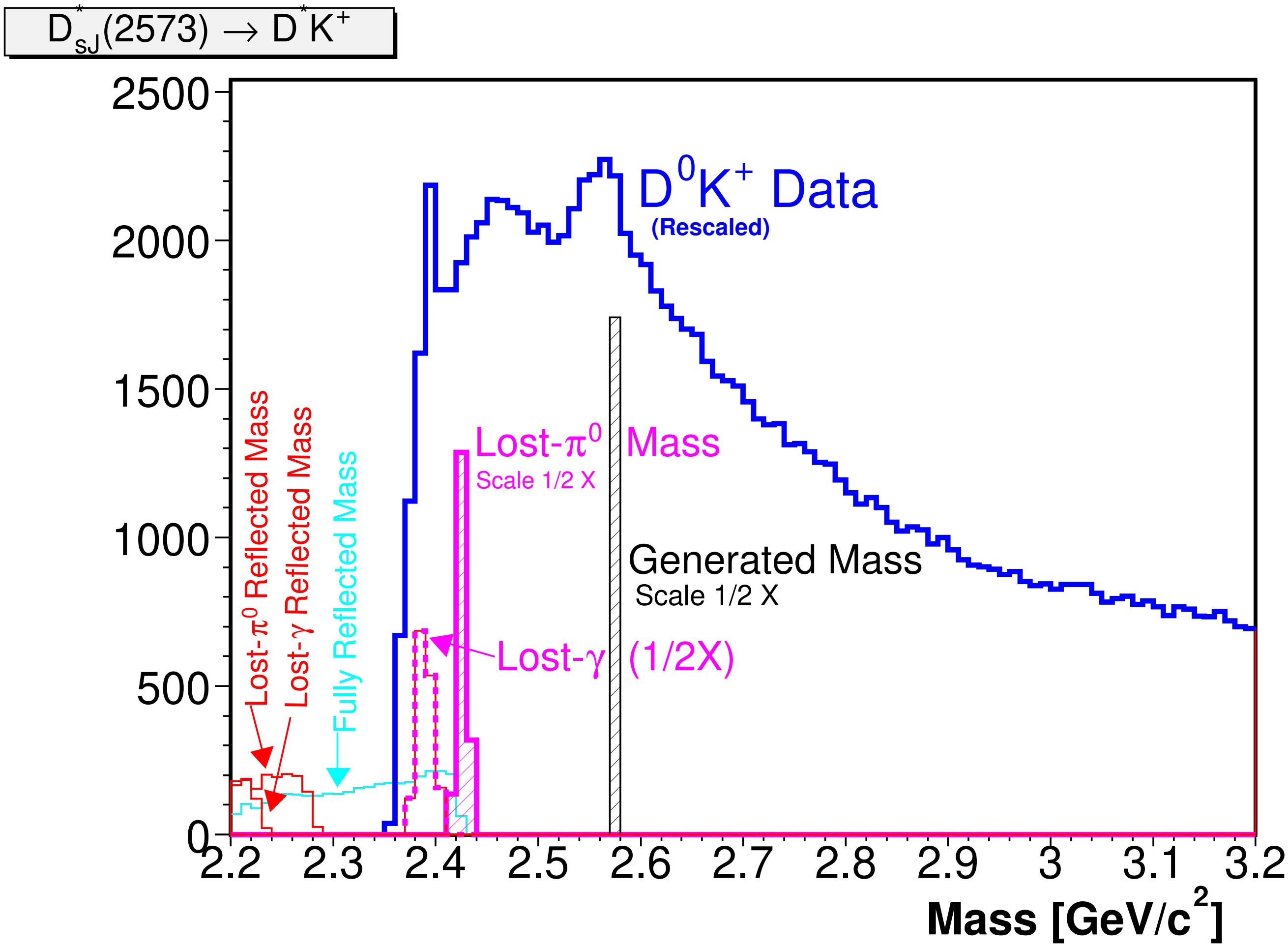
- **Excess Collecting Above 2.42 GeV**
  —Lower Half of "Mystery Bump"

$D^0 K^+$ from $D_{sJ}(2536) \to D^* K^+$:



- **Near-Threshold Spike**

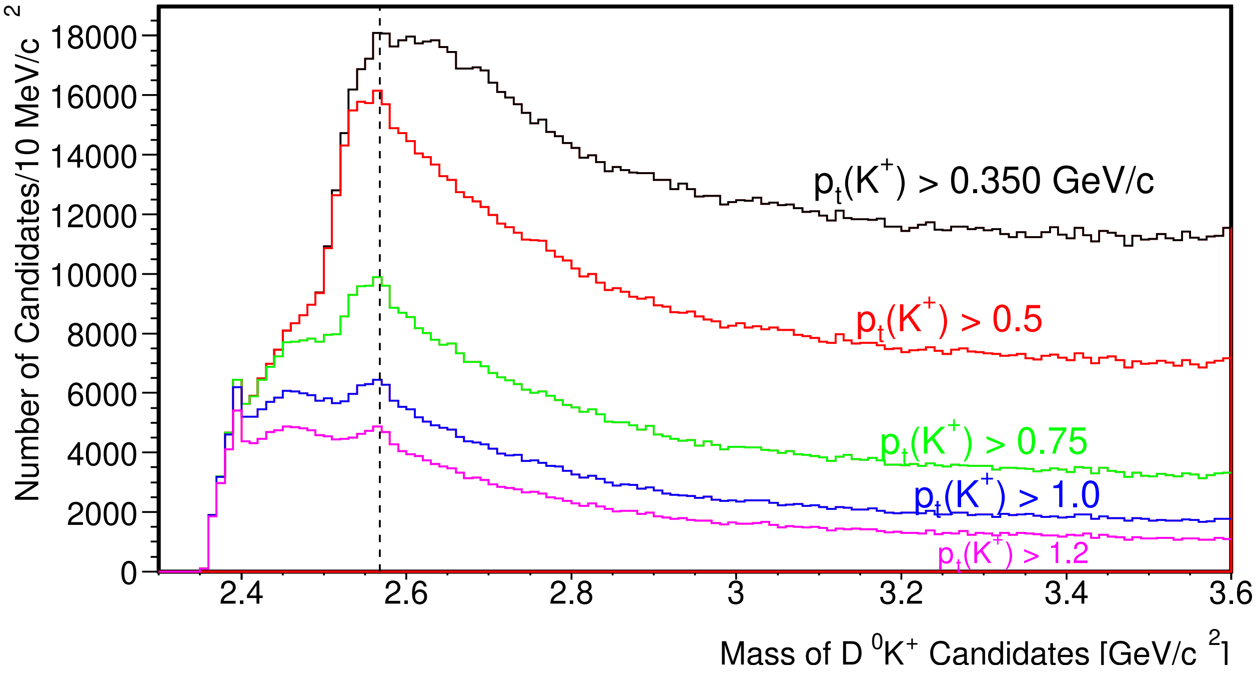
D^0K^+ from $D_{sJ}(2573) \rightarrow D^*K^+$:



- **Split Around Threshold Spike—No Clear Sign**
- **Mode Expected to be Suppressed**
- **D^*K^+ Mode Has Not Been Observed So-Far**

Cleaning Up the D^0K^+ Sample:

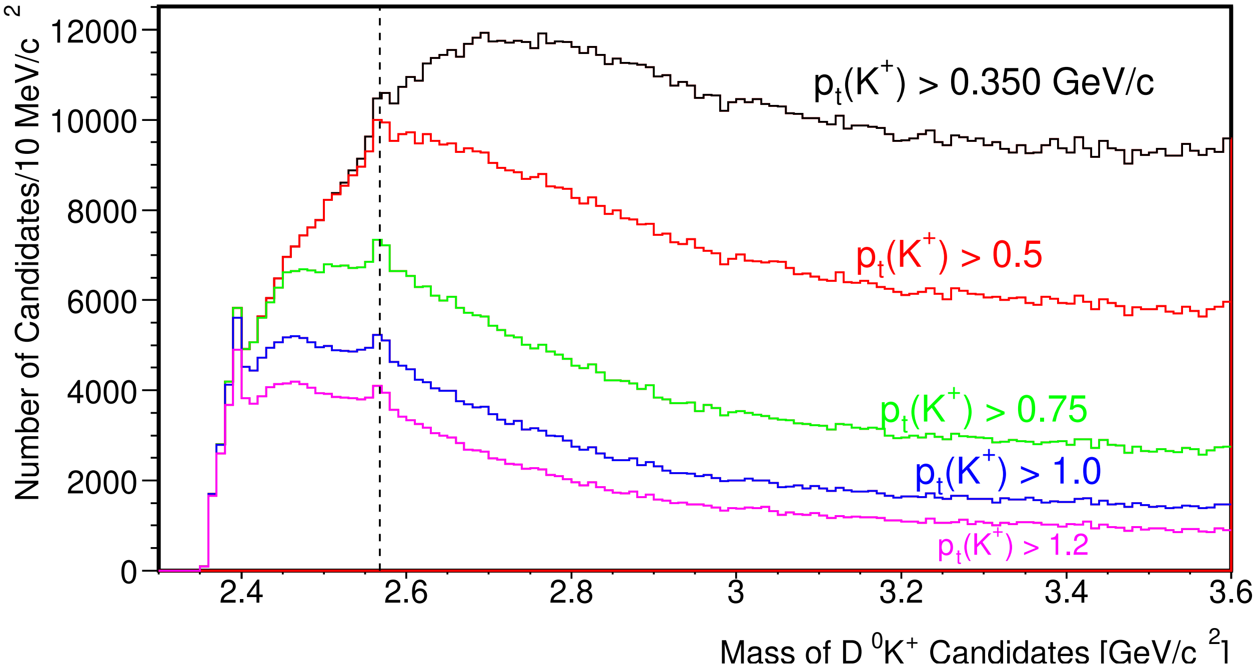
- **Same Old Selection Cuts**
- **Need $p_T(K)$ Cut to Bring Out $D_{sJ}(2573)$**
- **Mass Distribution for Different $p_T(K)$:**



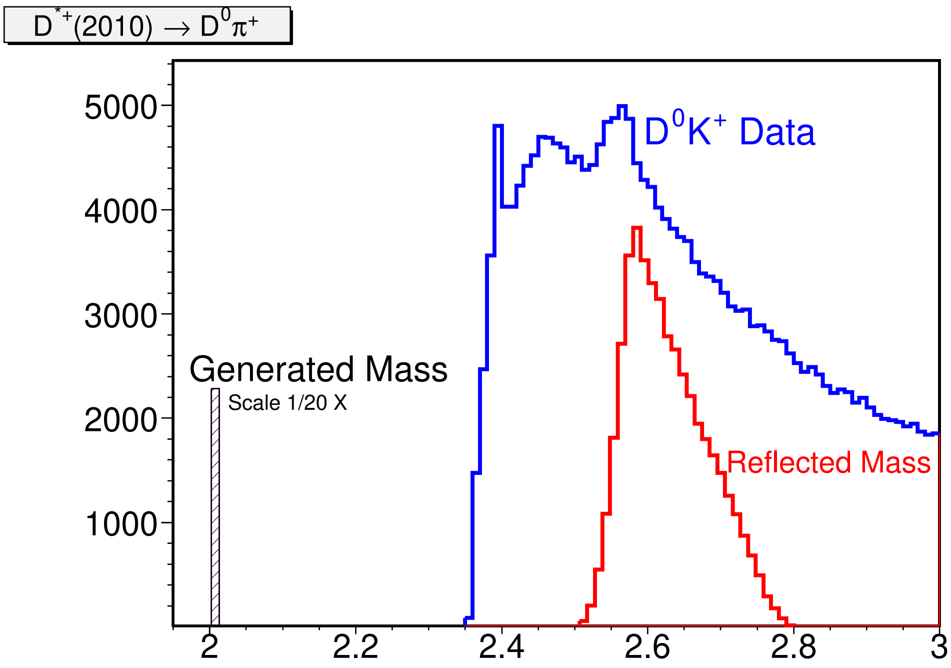
- **Bizarre & Ugly Turn-On ~ 2.5 GeV**

. . . One Way to Clean-Up a Little : Remove D^*'s!. . .

- D^*'s So Clean:
  If D^* in Event $\Longrightarrow$ Reject Entire Event

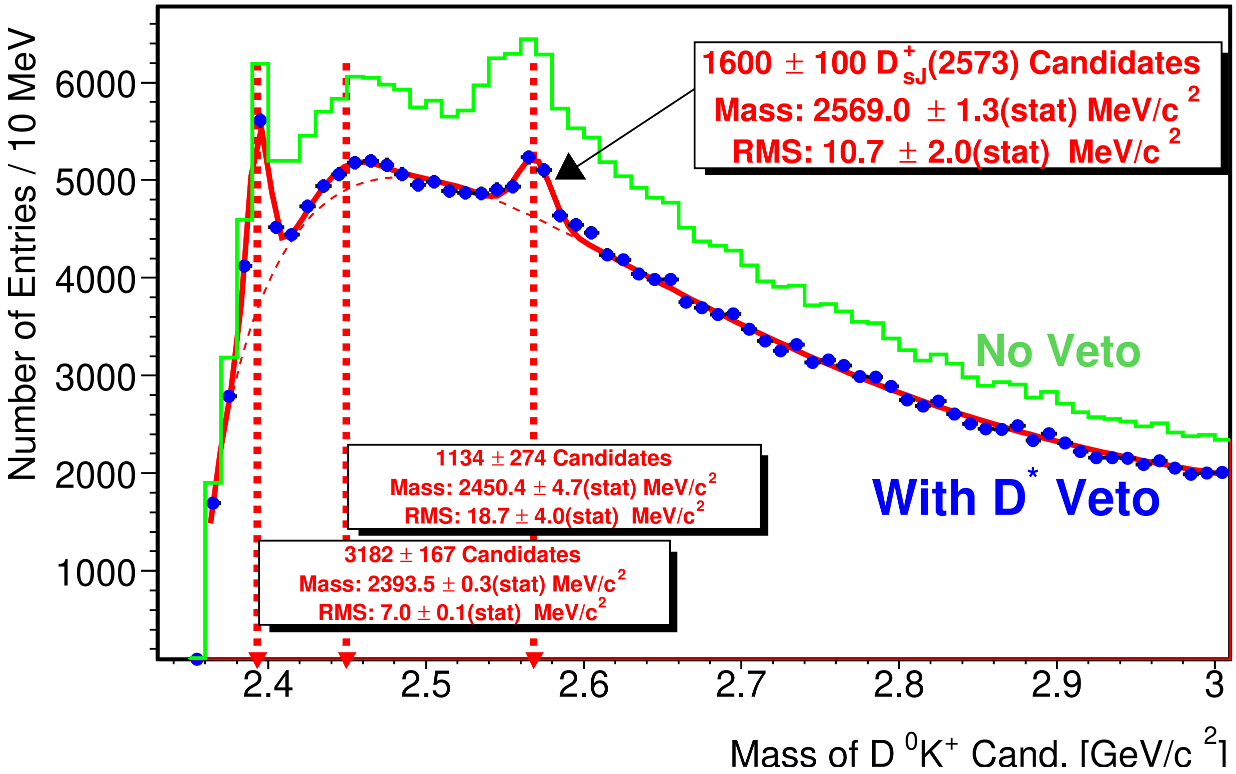


- Huge $D^{*+}(2010)$ Reflection to D^0K^+!



$D^0 K^+$ With D^{*+}-Veto:

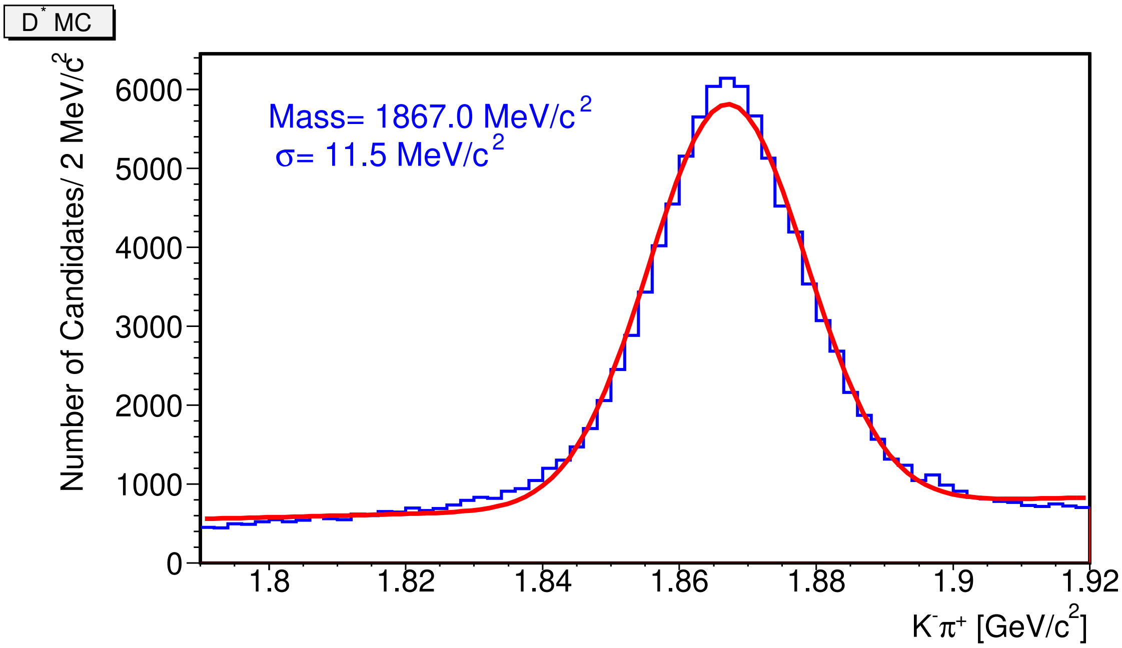
$p_T(K) > 1.0$ GeV/c:



- **With $D^{*+}(2010)$-Veto $\rightarrow$ Smaller Peak**
- **$D_{sJ}(2573)$ Width Near PDG**

Full(er) Simulation:

- **Need to Move to Full Simulation**
- **In Particular: What are D^{**} Resolutions?**
- **In Particular: Correct D^{**} Mass Scale?**
- **Starting to Run** BGEN+GENTRIG+QUICKSIM
- **E.G. Look at D^0 Resolution:**



- **In Data $\sigma = 9.6$ MeV/c^2**
- **In Data $M = 1864.5$ MeV/c^2**
- **Known Misstep: Energy Loss Not Simulated But Corrected Anyhow...**
- **More Work to Do...**

Summary:

- **Have Understood General Locations of Reflections**—*Messy!*
- **Huge $D^*(2010)^+$ Reflection**
- **Beginning More Sophisticated MC Studies**