

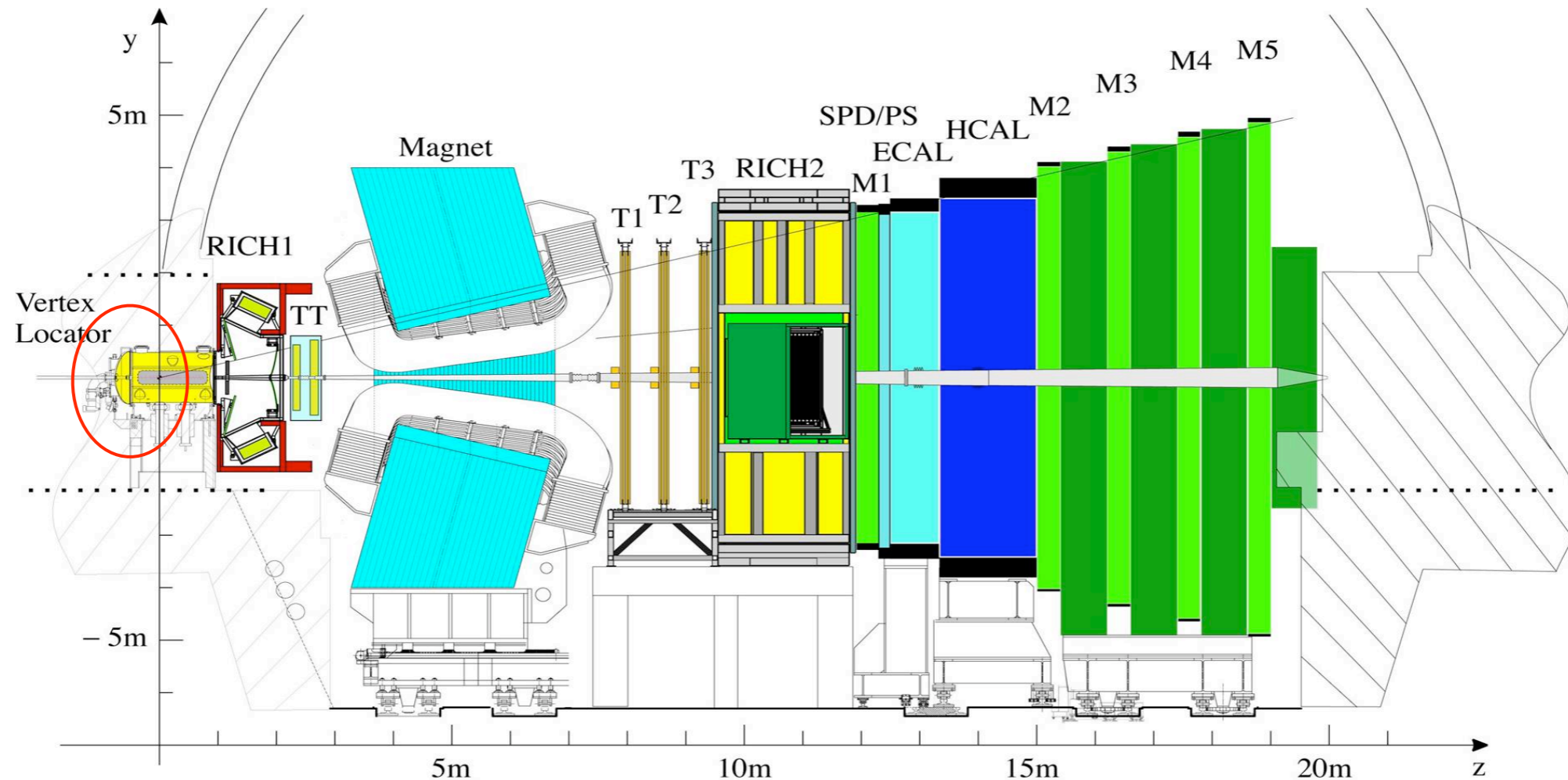
Reconstructing $B_s \rightarrow D_s D_s$ at LHCb

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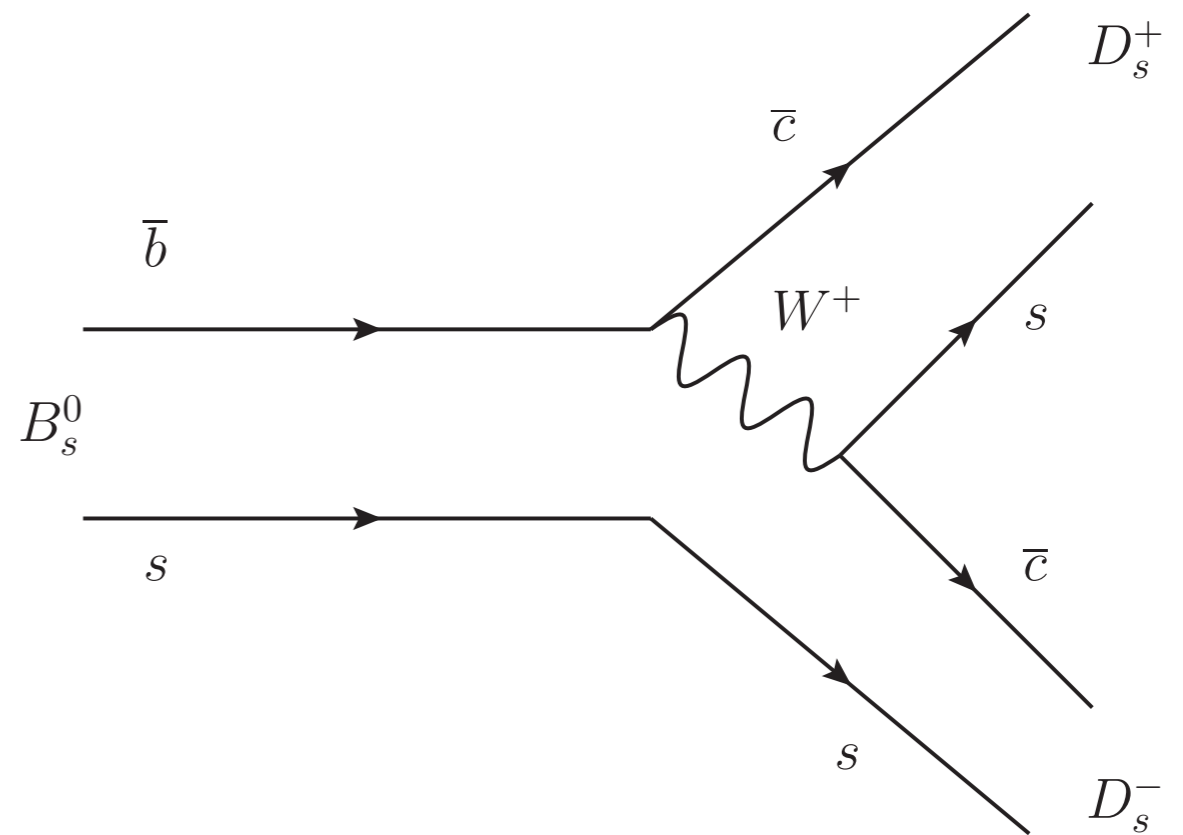
LHCb Detector



- Precision b physics experiment at LHC
- Looking for CP violation and rare decays

My Analysis

- $B_s^0 \rightarrow D_s^+ D_s^-$
- Using $D_s^+ \rightarrow K^+ K^- \pi^+$

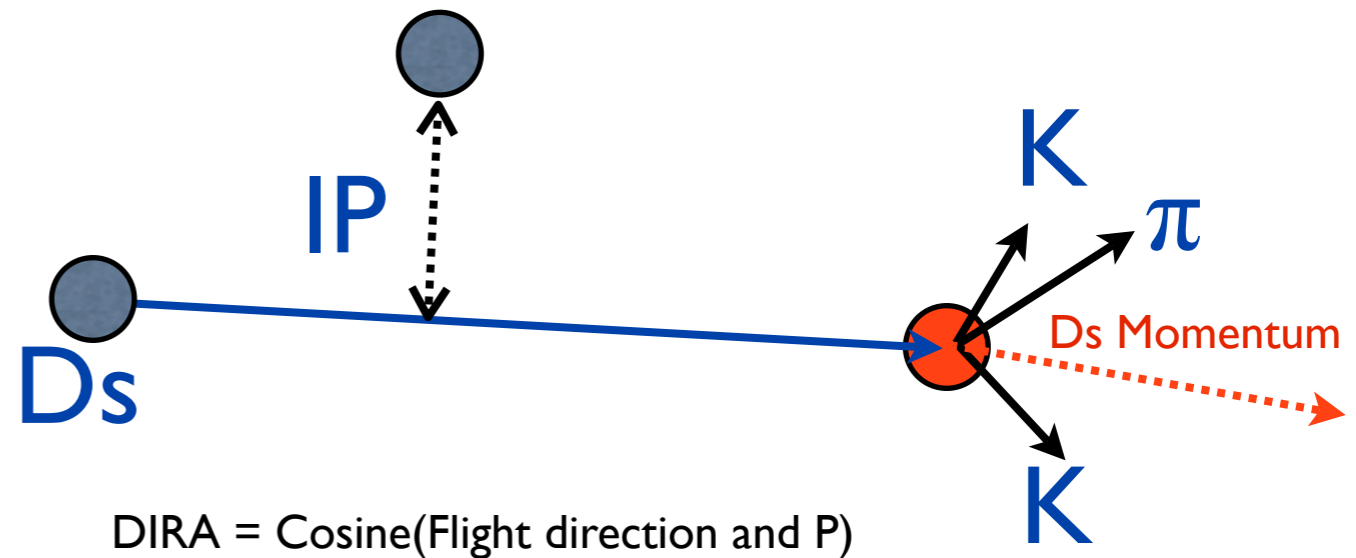


Why $B_s \rightarrow D_s D_s$

- Possible to measure Δm_s and $\Delta \Gamma_s$
- Fully reconstructible
- Requires good tracking and vertexing
- Need good K/pi separation
 - $B_s^0 \rightarrow D_s^+ D_s^- = 1.1 \pm 0.4 \%$
 - $D_s^+ \rightarrow K^+ K^- \pi^+ = 5.5 \pm 2 \%$

Reconstructing Ds

- Use $D_s^+ \rightarrow K^+ K^- \pi^+$
- Ds cuts:
 - Impact Parameter (IP) $\chi^2 > 100$
 - Direction Angle (DIRA) > 0.9975

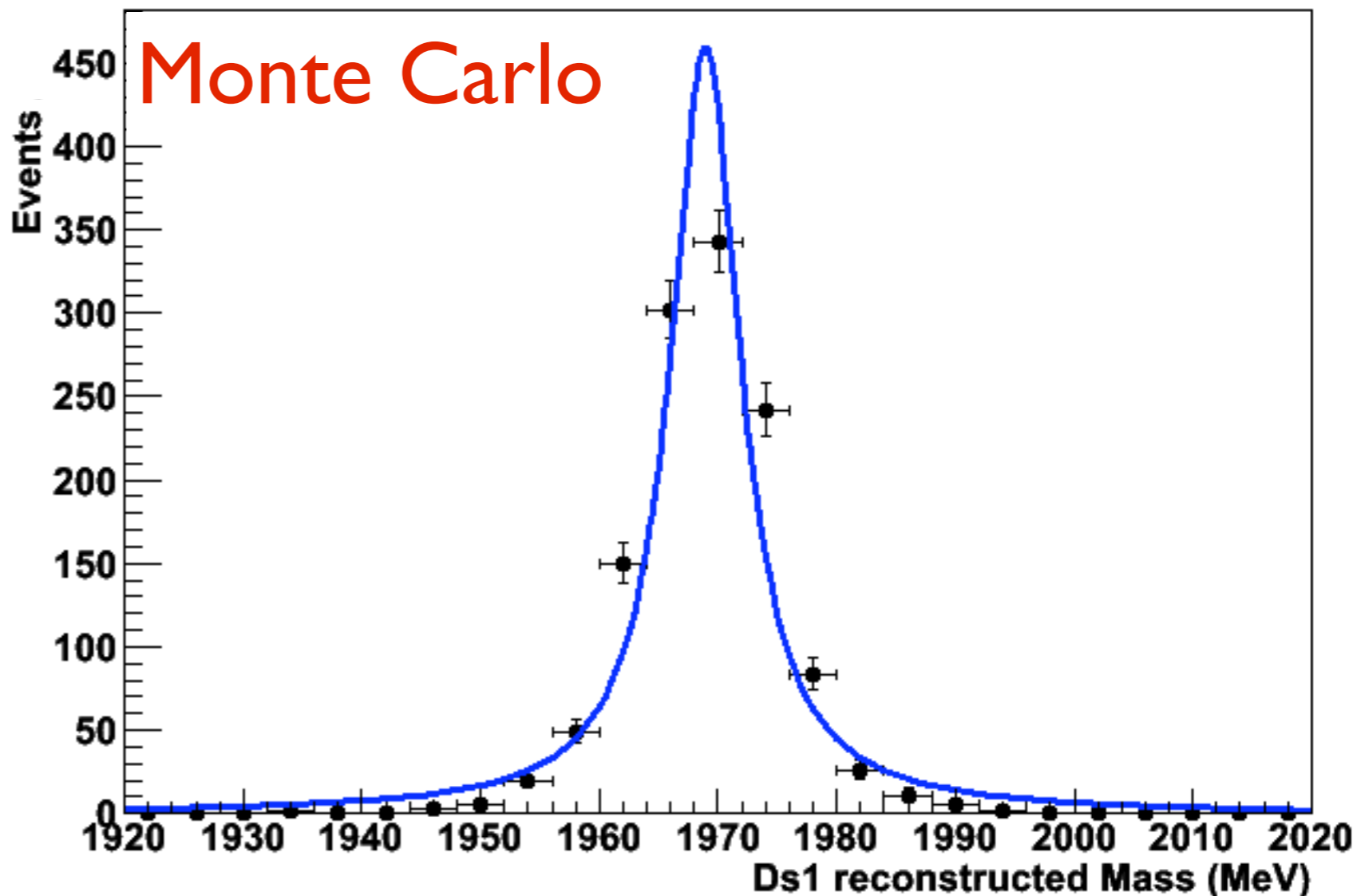


- Pion cuts:
 - Track $\chi^2/\text{DOF} < 10$
 - Min IP > 0.1
 - Min IP $\chi^2 > 10$
 - $P > 3.2 \text{ GeV}$
 - $P_t > 0.5 \text{ GeV}$

- Kaon cuts:
 - $\Delta \text{Log likelihood}(K-\pi) > -5.0$
 - Track $\chi^2/\text{DOF} < 10$
 - Min IP > 0.1
 - Min IP $\chi^2 > 2$
 - $P > 3.2 \text{ GeV}$
 - $P_t > 0.5 \text{ GeV}$

Ds Reconstruction(MC)

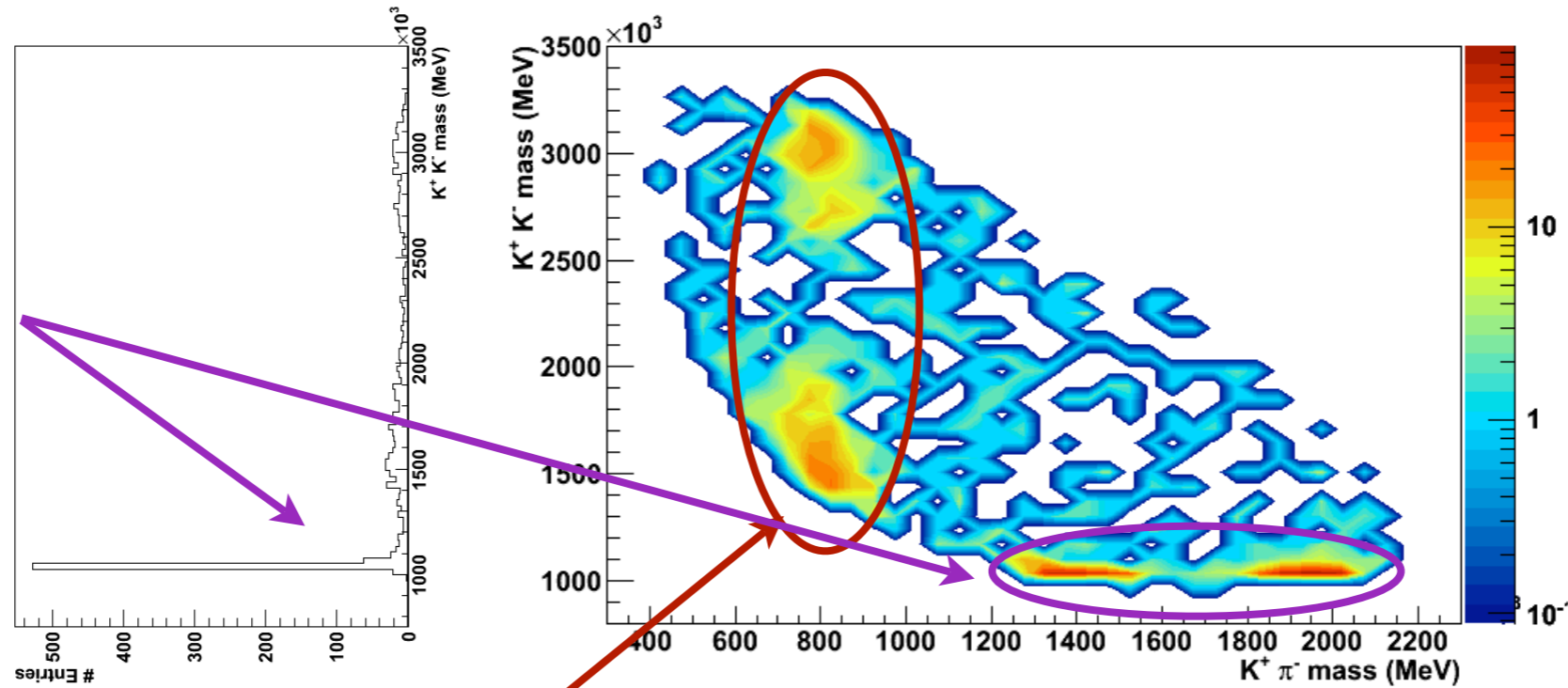
A RooPlot of "Ds1 reconstructed Mass (MeV)"



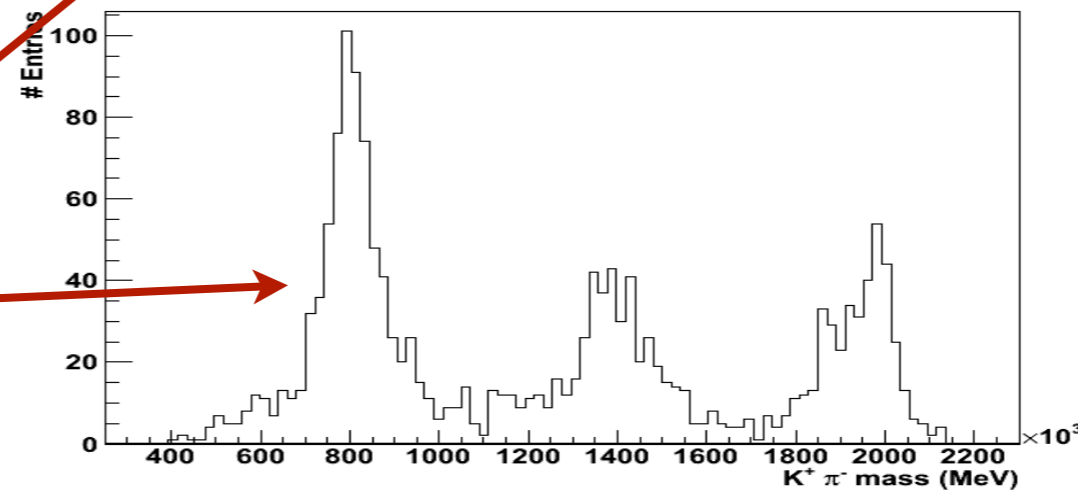
- Ds mass peak from $KK\pi$ decay

Dalitz Plots (MC)

Phi(1020)
Resonance



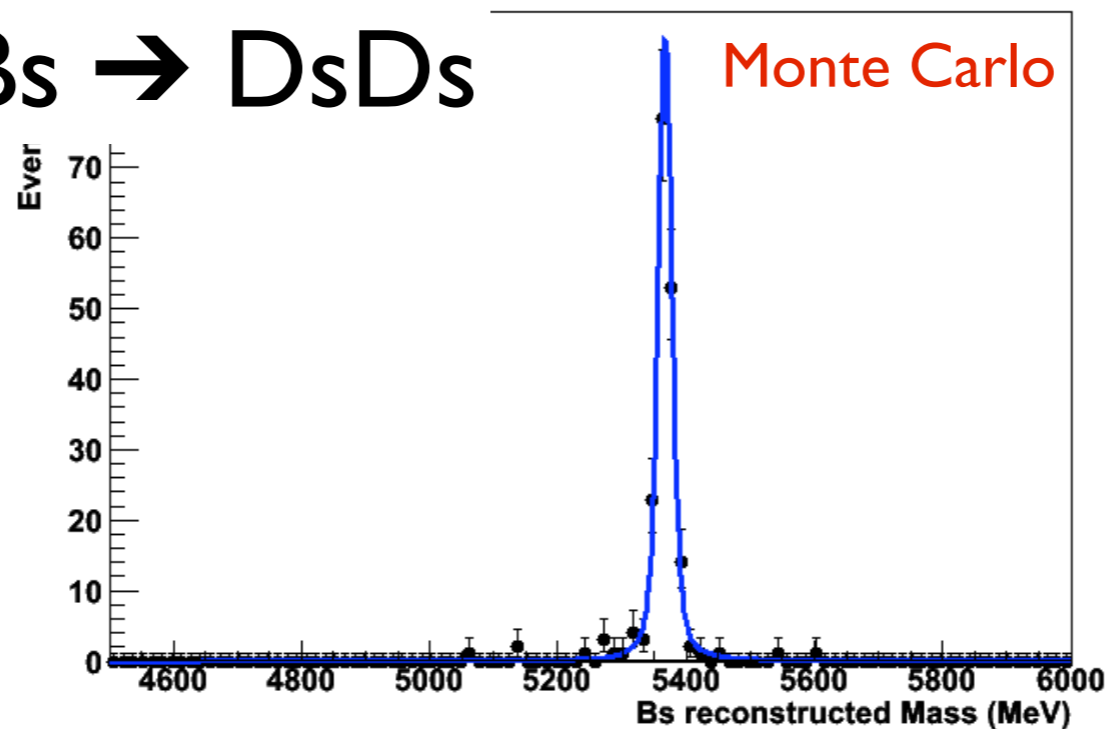
K*(892)
Resonance



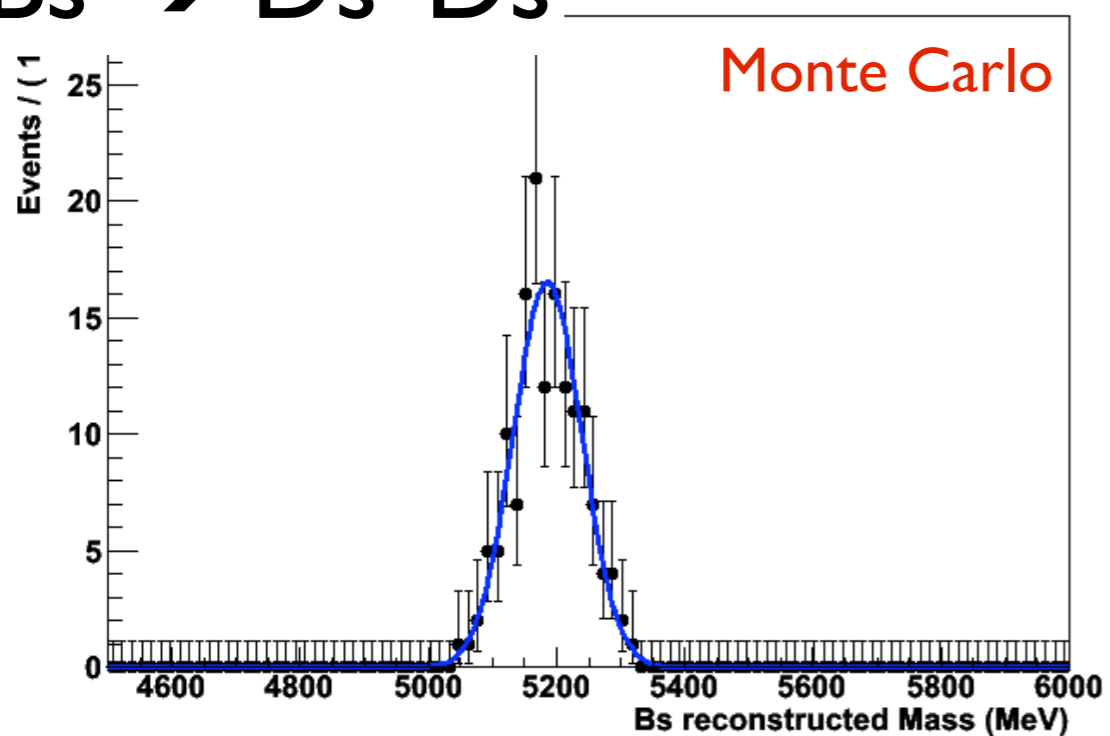
Ds*

- Other possible decays of Bs :
 - $B_s \rightarrow D_s^* D_s$
 - $B_s \rightarrow D_s^* D_s^*$
- Ds* decays to:
 - $\rightarrow D_s \gamma$ (94.2%)
 - $\rightarrow D_s \pi^0$ (5.8%)
- The γ and π^0 are not seen and the Ds is reconstructed as usual.
- The result is a shift in the Bs mass

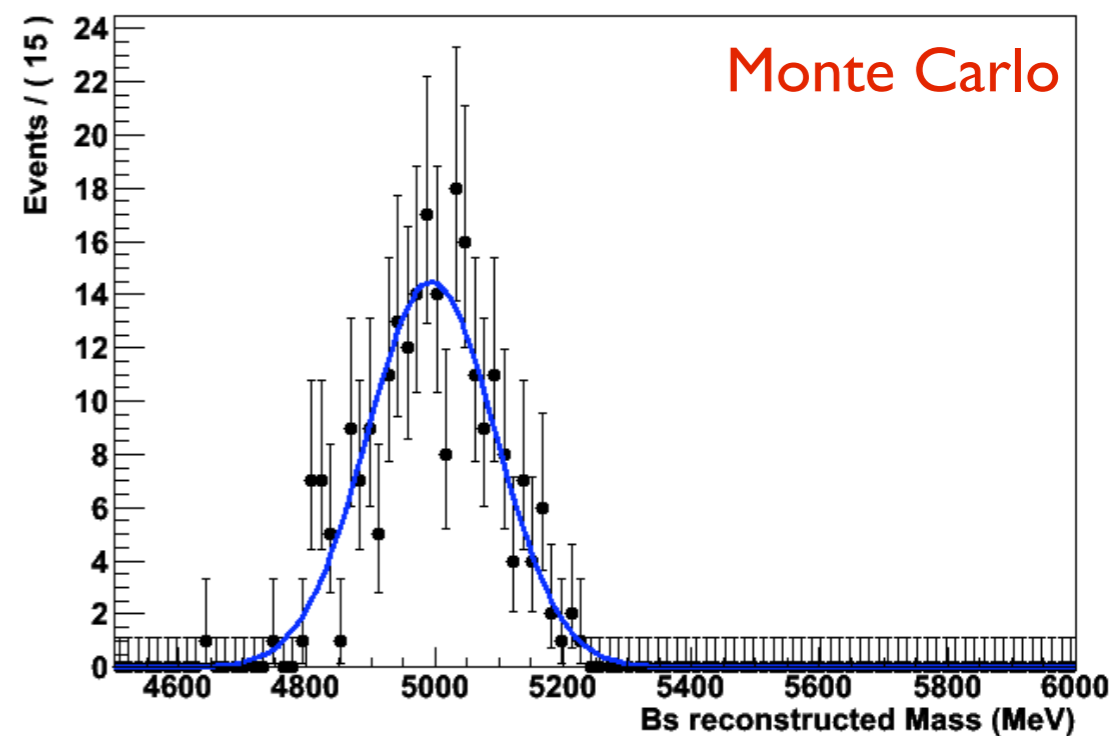
$B_s \rightarrow D_s D_s$



$B_s \rightarrow D_s^* D_s$



$B_s \rightarrow D_s^* D_s^*$



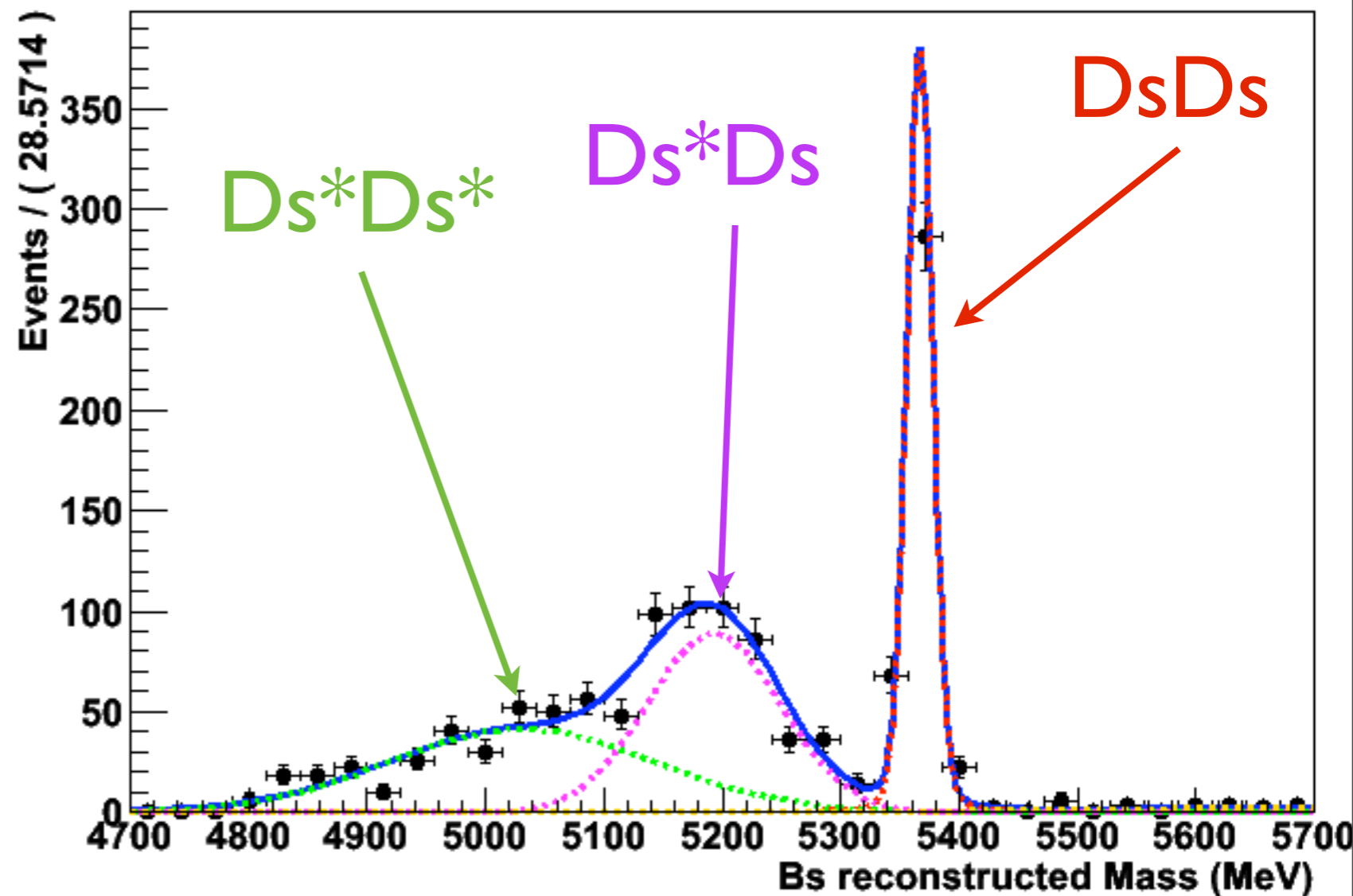
Bs Reconstruction

- Cuts:
 - DIRA(Cosine(Flight direction and P)) > 0.99975
 - Vertex IP $\chi^2/\text{NDOF} < 20$
 - Primary Vertex IP $\chi^2 < 120$
- Studied with Monte Carlo also looking at the effect of Ds*

Bs Mass

- DsDs peak fitted with a Breit-Wigner
- Ds*Ds(*) peaks fitted with Gaussian

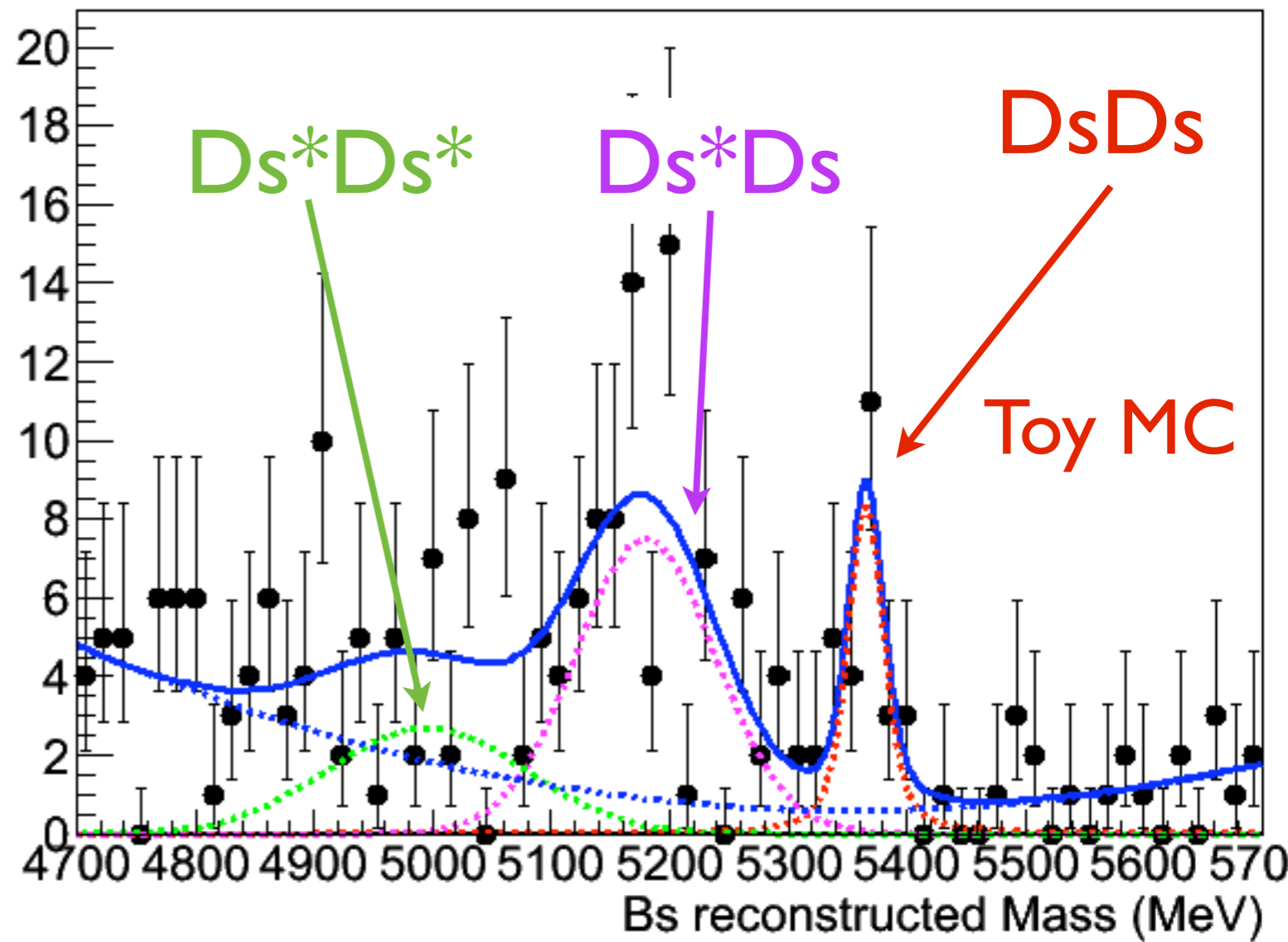
A RooPlot of "Bs reconstructed Mass (MeV)"



Expected Results 2010

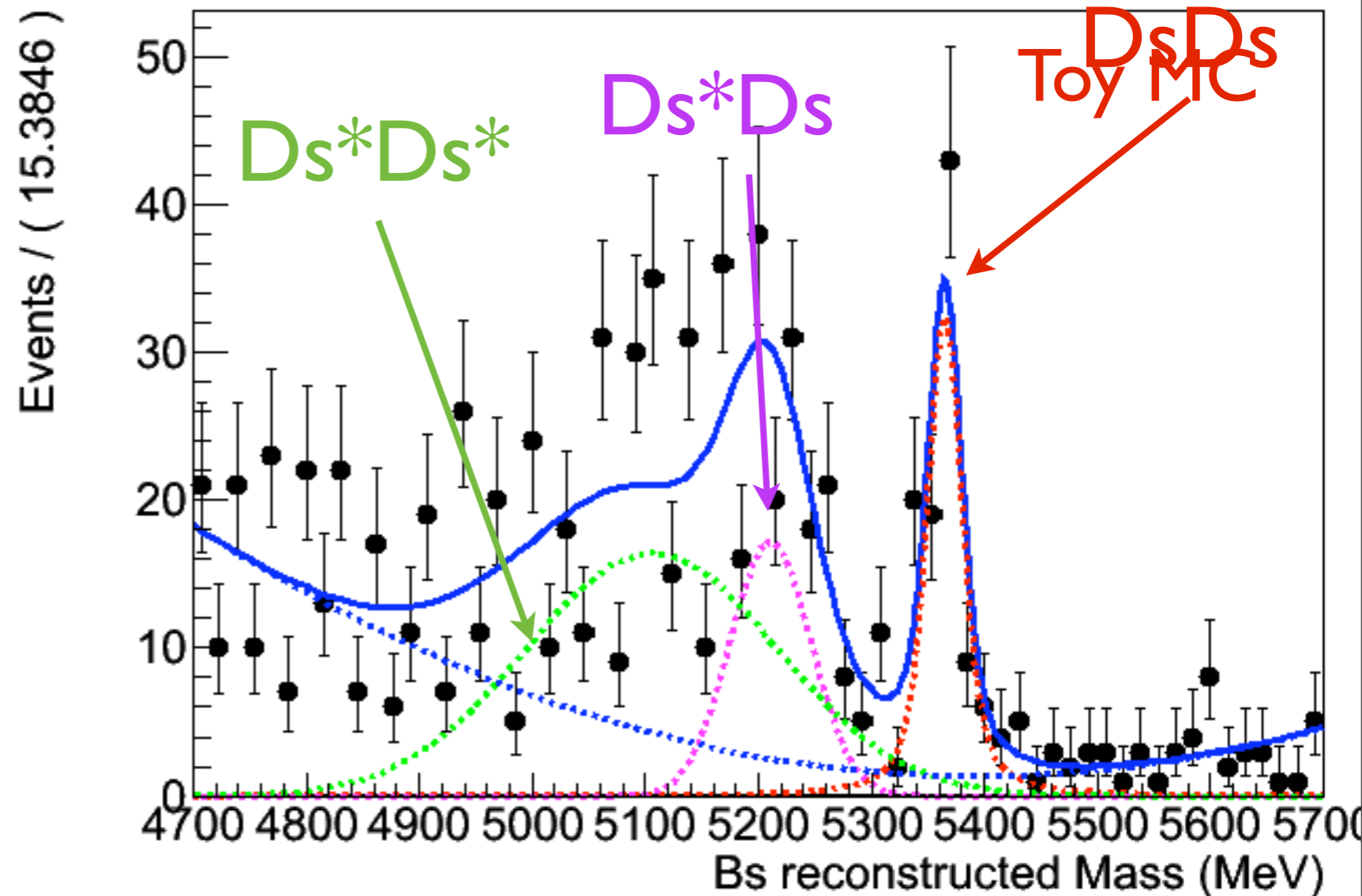
A RooPlot of "Bs reconstructed Mass (MeV)"

- Using Toy MC and using expected trigger efficiencies we expect to see in 2010 using $\sim 3 \text{ fb}^{-1}$



Prospects for 2011

A RooPlot of "Bs reconstructed Mass (MeV)"



- Scaling this (adding trigger pre-scale) we expect ~ 900 events in 2011 assuming $\sim 1 \text{ fb}^{-1}$

Conclusion and work in Progress

- Systematics are currently being studied
- Checks on clone rates
- Aim to reconstruct Bs peak with 2010 data
- Hope to make improved measurements with 2011 data.