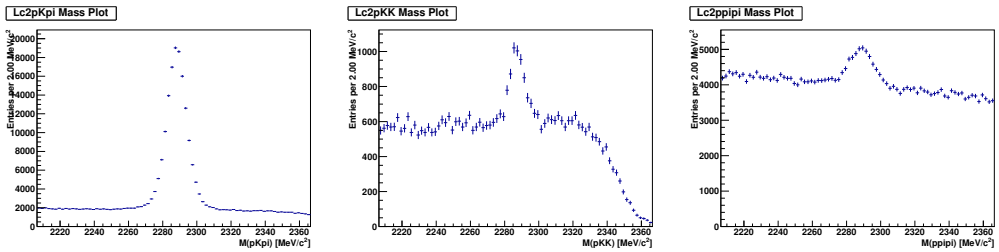
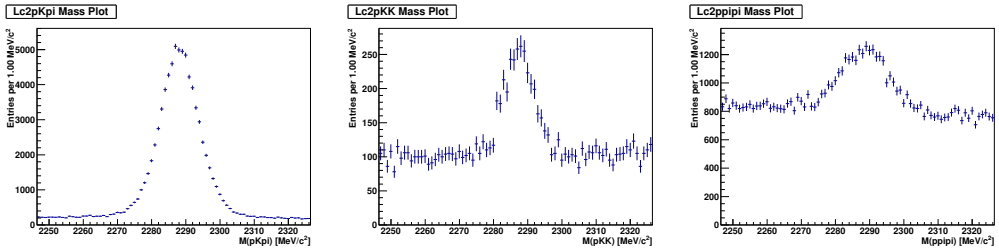
Shown herein are the mass plots for the promptly selected $\Lambda_c^+ \to p^+h^-h^+$. The first set of plots are after the full selection, including the kinematic vetoes, the DTF mass constraint, the trigger requirements and the offline PID cuts. The second have passed the same selection, and also had the BDT cut applied to them.



(a) (b) (c)

Figure 1: The mass distributions of the prompt candidates before BDT selection.



(a) (b) (c)

Figure 2: The mass distributions of the prompt candidates after BDT selection.

As can be seen, before the application of the BDT the $\Lambda_c^+ \to p^+K^-K^+$ and $\Lambda_c^+ \to p^+\pi^-\pi^+$ have very high combinatoric backgrounds, but we can confidently fit the signal. I'm worried about the effects the high background will have on our efficiencies, specifically those we utilise sWeights to derive (our stripping and PID efficiencies). Given the low S/B in our signal region before the application of the BDT I'm worried that our sWeighting isn't as reliable as it could be. The S/B after the application of the BDT is much, much better.

As such I think we should include the BDT in the selection of the CS, and possibly the CF, modes. The efficiency of the BDT cut should not vary to a high degree between the modes, as the BDT should be as agnostic as possible to the daughter properties. Even so, this should not matter. We have access to the yield before the application of the BDT, so we just fit before and after the BDT to extract its efficiency in each mode. In this way the efficiency we extract is a proper factor with the rest of the efficiency chain.

This might seem obvious, but indulge me for a moment. Imagine we were using average efficiencies, which are for sake of argument all correct. The adjusted yields before the BDT are then fine. We can fit the data before and after the BDT to get our efficiency. In our expression for the adjusted yield the number of events after BDT and our BDT efficiency cancel to give us the number of events before the BDT, and the same correct adjusted yield.

Here's a question for you. If that's the case, why did we have to utilise the MC to work out the efficiency of the $\mathrm{P} - \eta$ kinematic cuts? Why couldn't we just do the same, fitting the data before and after?

I only just properly worked that out today, previously I thought it was to do with correlations but it's not quite.