Progression Notes

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Missing Mass Cuts

The current debate is over what data to determine proper missing mass cuts.

Right now, for every event the number of each relevant identified hadron is counted, and depending on the number of each a different, but similar, procedure is followed. If a given hadron has only one measured in the event, then for all topologies with that particle present it will simply be presented as itself. If, however, a given hadron has been identified multiple times in a given event, then a loop over all such hadrons will be performed. For every one of these hadrons a missing mass for the specific topology will be calculated while utilizing all other available hadrons. If one of the hadrons passes the missing mass cut for the given topology then it is said to be the event hadron and is assigned as such.

If there are multiple hadron species with more than one identified particle in the event, then there will be nested loops over each hadron species. In order to not allow dual identification a check is made for protons and π^+ to ensure that the same particle is not being viewed as both. Such a check corrects for both dual identification as well as selecting the relevant event particles.

During this stage, however, it is important to note that there are two different ways to create a Missing Mass plot to fit and find a proper cut range for. It can be done with events in which only one of each relevant hadron was measured, or end up multicounting all the events where there are multiples of a given hadron.

This issue becomes events which have multiples of given hadron species will be over represented in the sample because a loop is performed over each hadron species with multiples measured. For example, if an event had two identified protons and two identified π^- then for the π^+ missing topology that event would get four separate points on that plot, which only one of which would even have a possibility of being the correct set for the event. This unequal weighting of procedural background gives the background greater influence and widens the peak of the missing mass. This naturally leads to an artifically wider cut than would otherwise be present.

I argue that in determining the proper missing mass cut range, one should only look at the pre-cut plot formed when there are no extra relevant hadrons identified such that each event has equal weighting in the plotting. While there will be a decrease in statistics, it is not so severe that a reasonable cut cannot be determined. The issue comes in that the set of particles being cut on is not the same, because the cut parameters were determined without these extra hadron events and as such, can one truly consider this philosophically sound?

I argue that it can be considered sound because every individual cut is ignorant of the fact that there are multiples of a given hadron and is treating each possible event hadron as if it were the only one. In such a situation I feel it is only natural to use the cuts extracted from a data set in which only one of each relevant hadron was identified in each event.