

November 2019 - January 2020: Framework Development and Validation

The multiple frameworks in the Z+hf analysis group currently show promise, but are not yet ready for full analysis. During this time period, it would be ideal to achieve the following goals:

- Implement systematic uncertainties
 - Currently the ZHFReader code has functionality for the systematics, but they do not appear to function correctly.
- Validate between the frameworks
 - This requires participation within the analysis group and is not fully attainable by working alone, however there are some steps that could already be taken to prepare for this stage such as production of lists of event numbers.

February 2020 - April 2020: Production of top and multijet enriched control regions

Measurements of prevalent backgrounds can be performed in order to reduce uncertainties before unfolding, or to even to avoid propagating negligible backgrounds through the entire analysis. During this time period, it would be ideal to achieve the following goals:

- Create a multijet enriched control region to enrich multijet event numbers by deliberately requiring the presence of multijet background events (for example by requiring two same sign muons as opposed to two opposite sign muons).
- Create a top control region to enrich top event numbers by treating $emum$ events as a signal source as opposed to ee or $mumu$ events.
- Analyse these control regions and their systematic uncertainties in order to obtain accurate event numbers and neglecting to propagate these backgrounds through the analysis if these backgrounds are negligible.

May 2020 - July 2020: Flavour fit

In the same way that top and multijet control regions can be used to perform accurate measurements of these backgrounds, a flavour fit can be used to distinguish between the Z + light, Z + charm, and Z + bottom backgrounds. This is especially important for the Z+b process, as Z + light and Z + charm are two of the largest background contributors. During this time period, it would be ideal to perform this fit for both the Z+b and Z+bb processes. During this time period, it would be ideal to achieve the following goal:

- Perform an accurate flavour fit for both the Z+b and Z+bb channels

August - October 2020: Unfolding and generator comparisons

Unfolding is the crucial step that allows an analysis taking place at detector level to be transposed to particle level in order to obtain meaningful results. Prior to unfolding, the best possible modelling of the obtained data can be found by performing comparisons between multiple varieties of monte carlo generator. More MC samples from a greater variety of generators can be obtained by making the analysis appealing to PMG members. During this time period, it would be ideal to achieve the following goals:

- Reproduce existing work using a variety of different MC generators
- Unfold the analysis to a high degree of accuracy