

BcVegPy bug

There is a bug in 2012 MC generated with BcVegPy:

- forward/backward asymmetry (see https://twiki.cern.ch/twiki/pub/Main/BcVegPyWeights/Bc_ETA_2012.pdf, normally MC is generated in the LHCb acceptance, so the bug is hard to spot)
- pT(Bc) too hard

The bug has been reported to the simulation group [JIRA task] and a fix has been developed. Since the bug was due to a statistical fluctuation in the 8 TeV grade files, it only affects 2012 MC, **not** any other year.

I also reported it in the B2OC meeting and the B2OC summary of LHCb week.

I produced 50M generator level Bc events without any cuts before and after the fix. Taking the ratio of the two gives weights that can be used to correct the buggy MC. The weights as a function of the Bc production spectrum (pT, eta) or (pT, y) are available in my public area:

/afs/cern.ch/user/a/atully/public/BcVegPy_weights/BcVegPy_weights_2012.root

Inside this root file are a few histograms:

- hist_prodspec_eta_fixed - the production spectrum (pT, eta) with the bug fix applied
- hist_prodspec_y_fixed - the production spectrum (pT, y) with the bug fix applied
- hist_prodspec_eta_buggy - the production spectrum (pT, eta) with the bug
- hist_prodspec_y_buggy - the production spectrum (pT, y) with the bug
- ratio_eta - the ratio of hist_prodspec_eta_fixed normalised to 1 and hist_prodspec_eta_buggy normalised to 1, the weight was set to 1 if there were less than 20 entries in the bin of either histogram before normalisation
- ratio_y - the ratio of hist_prodspec_y_fixed normalised to 1 and hist_prodspec_y_buggy normalised to 1, the weight was set to 1 if there were less than 20 entries in the bin of either histogram before normalisation

The weights in (pT, eta) look like this:

https://twiki.cern.ch/twiki/pub/Main/BcVegPyWeights/BcVegPy_weights_eta_2012.pdf

To evaluate the weights, the **MC truth** values of pT(Bc) (in MeV/c) and eta(Bc) or y(Bc) should be used as the x and y coordinates. The z value of the corresponding bin is the weight. These weights can be used for any Bc decay mode since they are based on the properties of the Bc.

When I evaluated the weights on my Bc->DD MC, the mean was ~0.9. This is slightly counterintuitive behaviour:

- from forward/backward asymmetry, expect >1
- **pT spectra is also being softened**

Overall, the effect of applying these weights is a ~10% decrease in Bc yield.

-- AlisonTully - 2019-08-06

This topic: Main > BcVegPyWeights

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