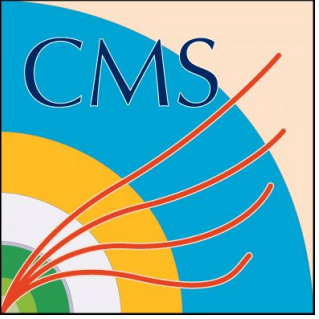


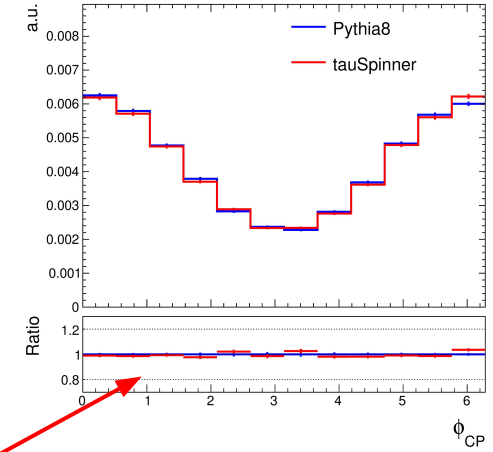

Imperial College London

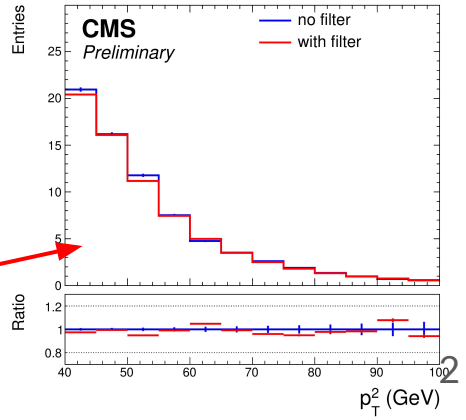
# MC status

Daniel Winterbottom

# Overview

- For analysis MC samples we have gone with POWHEG generator
- This gives us NLO samples and has nice advantage of not having (many) negative weights so is efficient with event statistics
- Rather than producing separate samples for CP-even, CP-odd and CP-mixed we decided to produce samples with spin correlations disabled
- Tauspinner then used to reweight events
  - This reduces required event statistics by ~ ⅓
  - Modelling is basically identical to Pythia8
- Additional filters on visible tau decay products $p_T$ is further used to reduce required statistics



# Event numbers requested

- We have requested 20M ggH, 20M VBF + 9M VH events for each year
- The 9M sample size for VH was chosen to give ~ the same statistical uncertainty as the VBF for 2jet events
  - ➢ This is actually broken down into 3 samples: 4M ZH events, 3M $W^+H$ events + 2M $W^-H$ events
- In addition to these samples we also requested smaller samples with no gen filter applied
  - ➢ These are to be used to estimate theory uncertainties properly or other studies that people may want to do
  - ➢ 500k ggH, 500k VBF + 300k VH events requested

# Current status

- Prepared fragments for all years
- Gridpacks the same as already used for other MC samples so didn't need producing
- We had to backport modifications to a generator filter to the 3 CMSSW releases used for MC production in 2016, 2017, and 2018
  - The created quite a bit of a delay (more than I anticipated)
  - However the backporting is now complete
- HTT MC contacts have now prepared and submitted the requests
- Submitted with low priority currently but we will try and have at least 2018 put into block 1

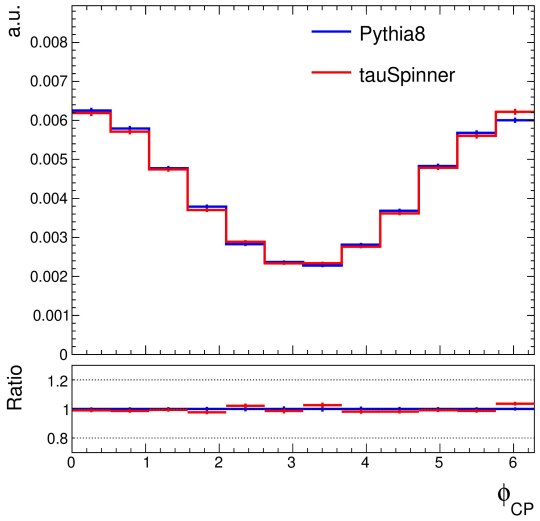
# Backup

# Private Samples

- While waiting for official MC you are encouraged to use the samples we produced privately
  - (listed on twiki: https://twiki.cern.ch/twiki/bin/viewauth/CMS/HiggsCPinTauDecays )
- We have 20M ggH + 20M VBF events for 2016 (with filter applied)
  - But for non-legcay samples so difficult to use (e.g different tau reconstruction)
  - Recommend to take shapes of CP-sensitive variables from these samples and then scale the yields predicted by standard MC samples
- We also produced 2017 samples but the statistics aren't as good
- ~ 5M ggH events + ~ 3M VBF events (with filter applied) [+ a few extra is you include un-filtered samples etc]
- Can use 2017 for 2017, 2018 and 2016-legacy more easily than for 2016 samples
  - I.e ntuple production should be the same
  - Need to apply appropriate PU re-weighting for each year
  - If the triggers you need aren't included you can not apply any triggers and use efficiency calculated for data as the scale-factor!
  - Remember pixel detector was upgraded after 2016 - so not sure how this affects IP method

# Gen Comparisons: πϱ

- Generator level comparisons of “mixed” method for πϱ final state
- Tauspinner agrees well with Pythia8

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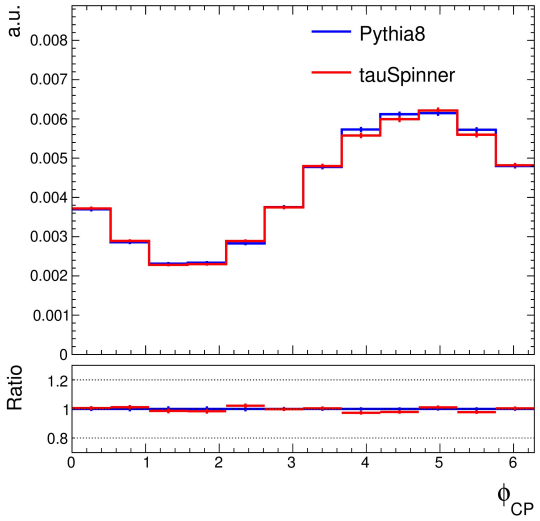


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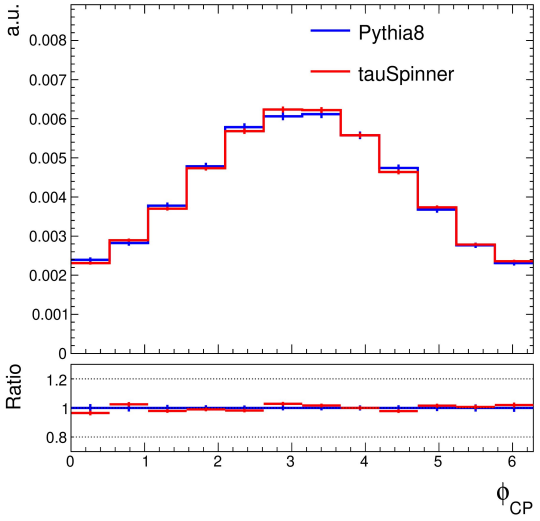


PS

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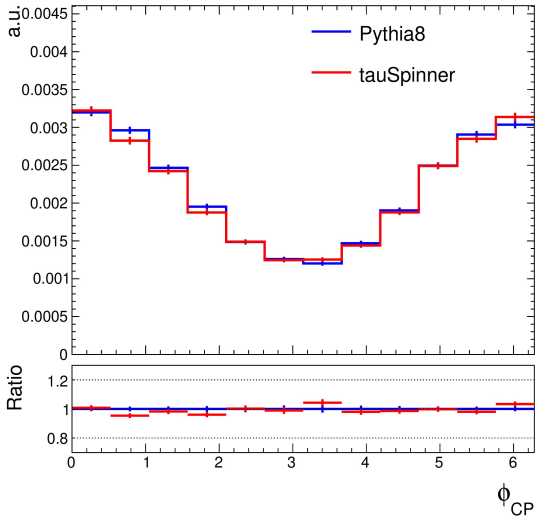


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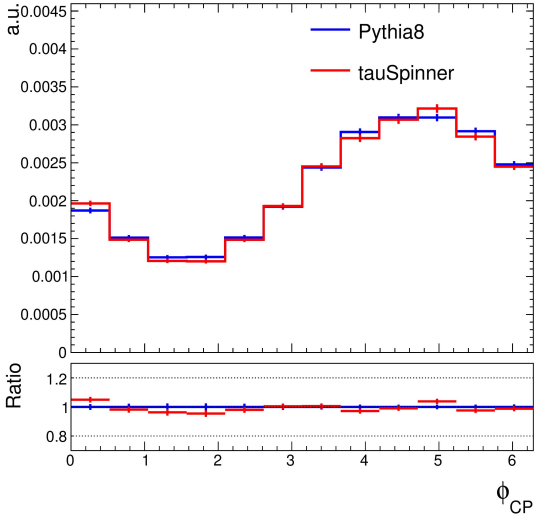


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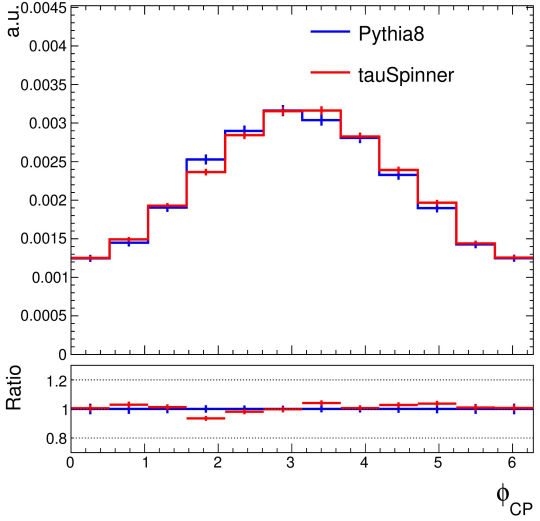


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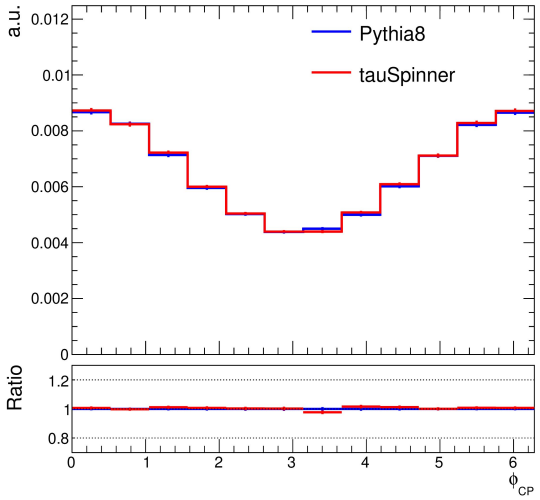


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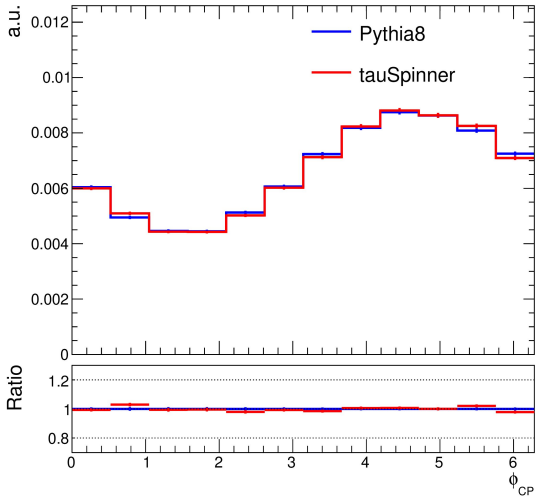


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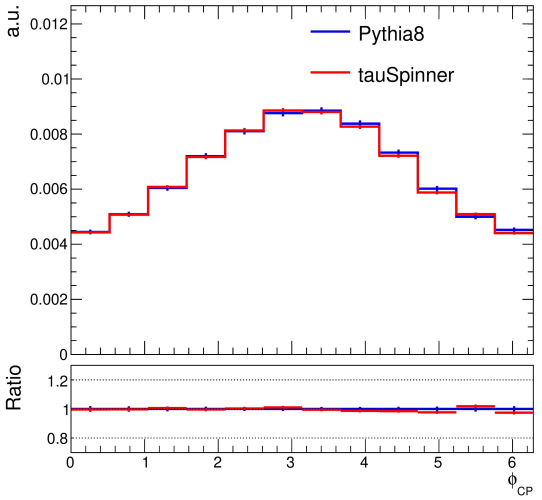


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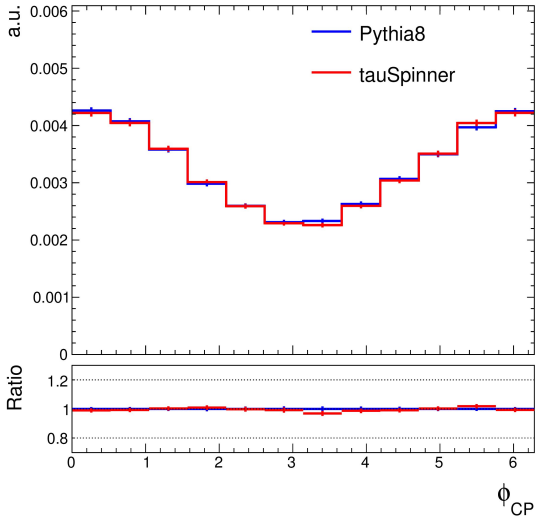


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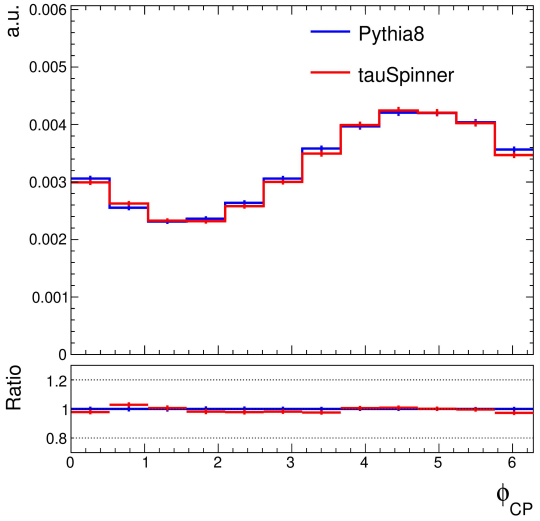


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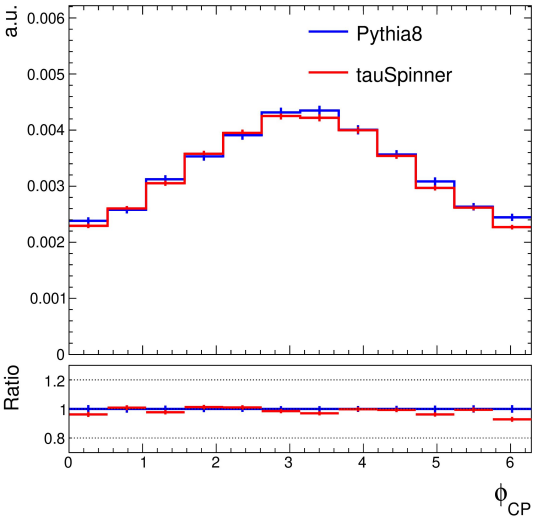


PS

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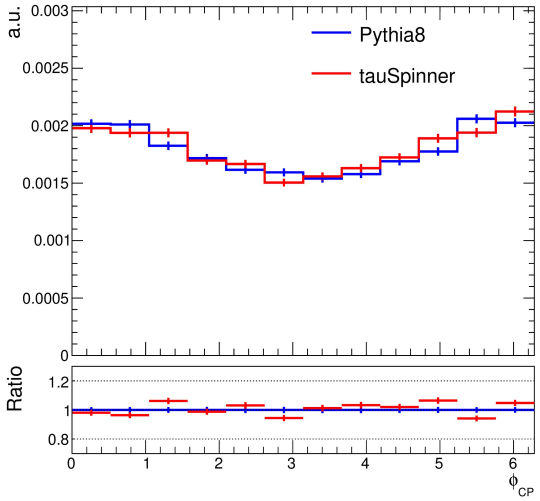


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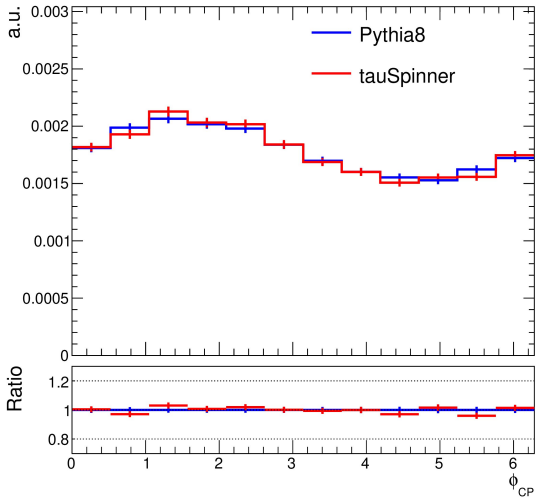


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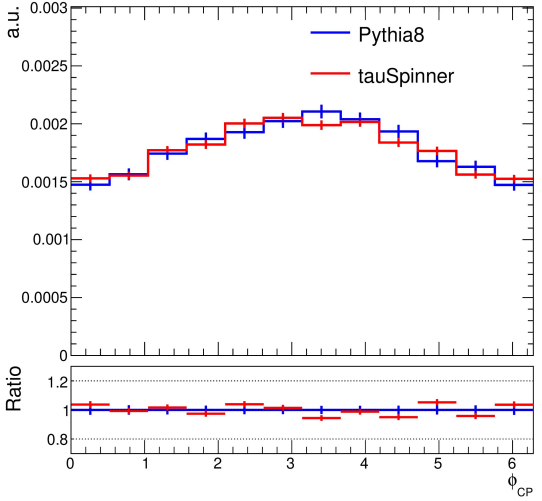


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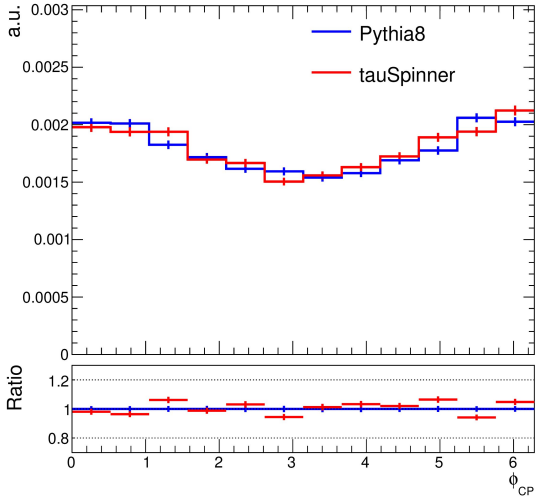


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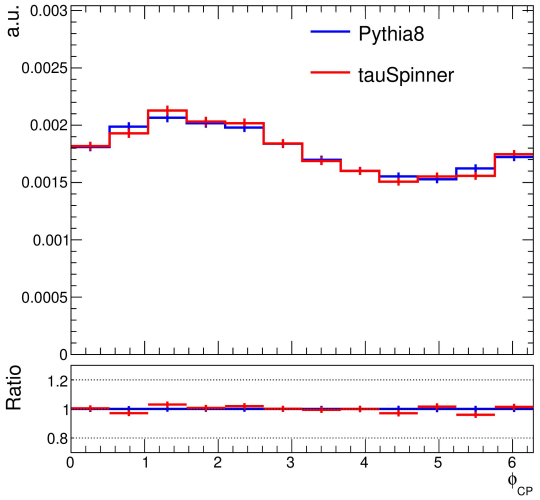


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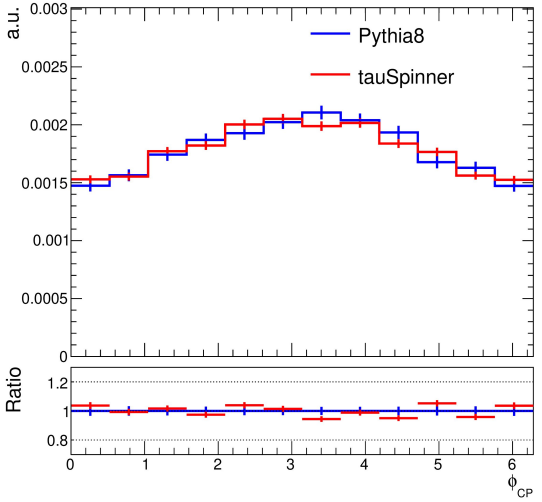


PS

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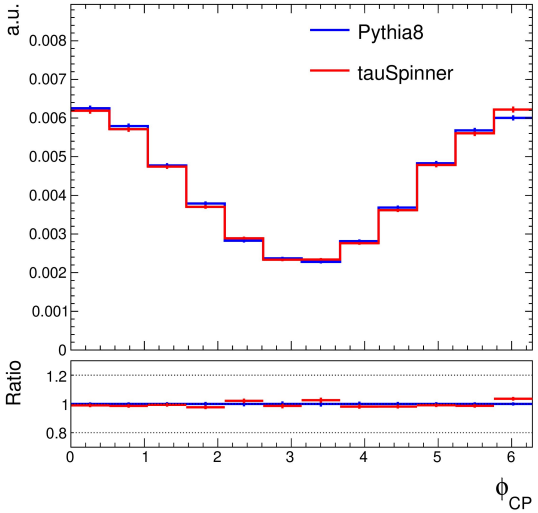


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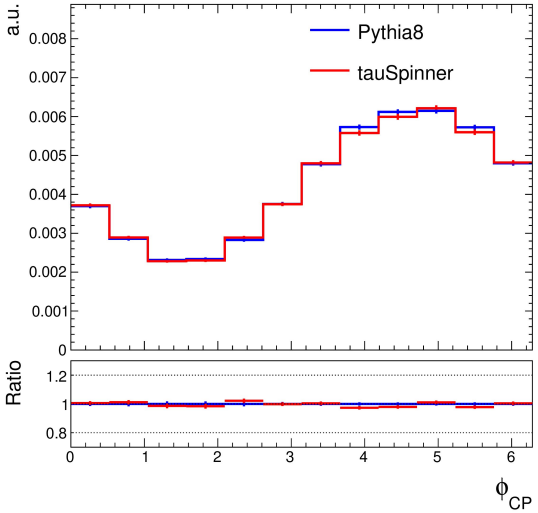


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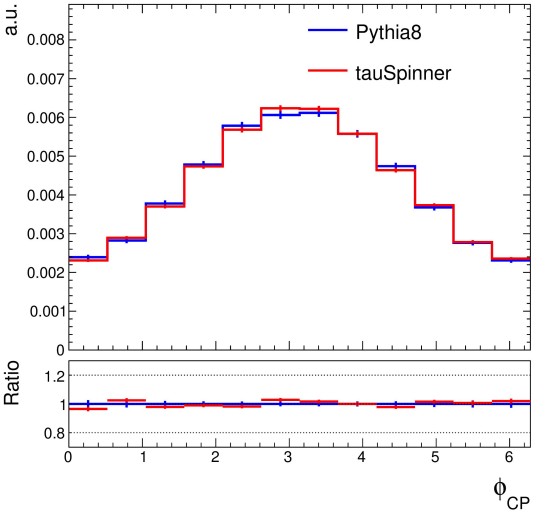


PS

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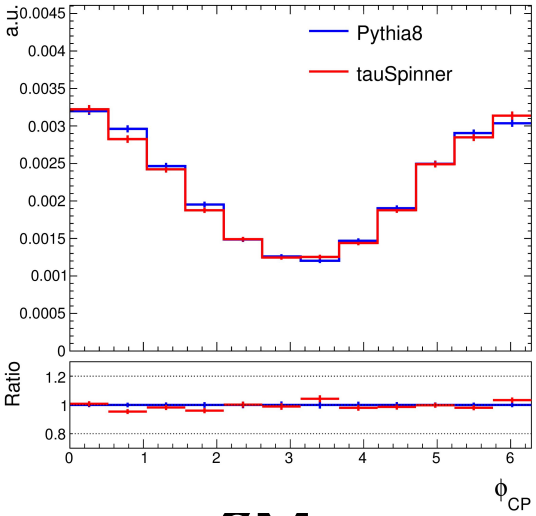


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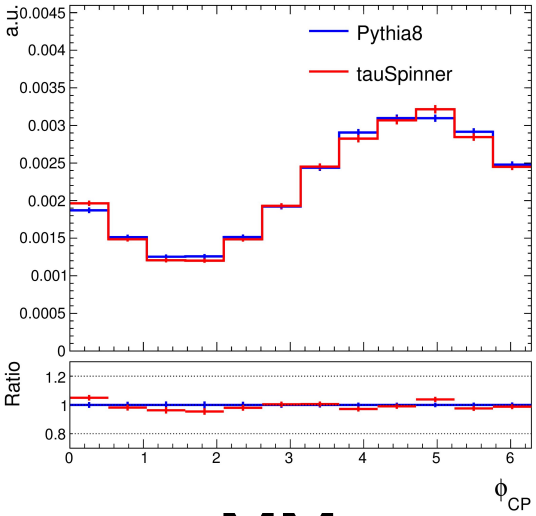


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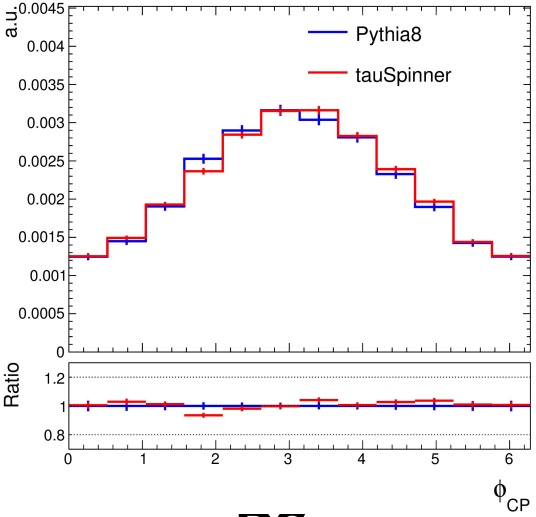


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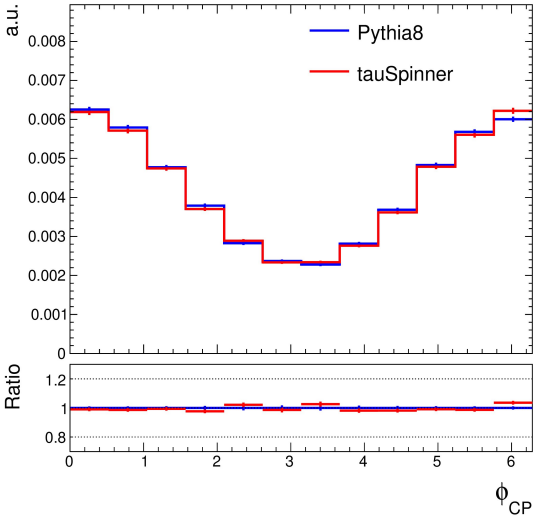


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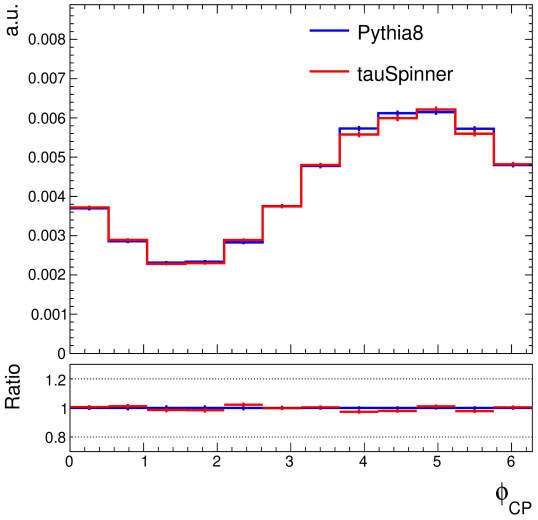


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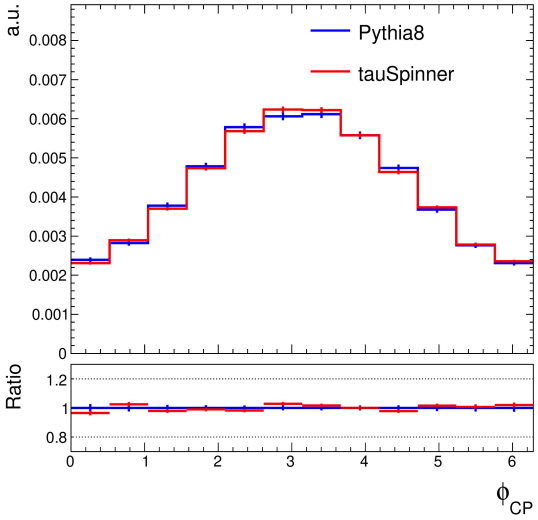


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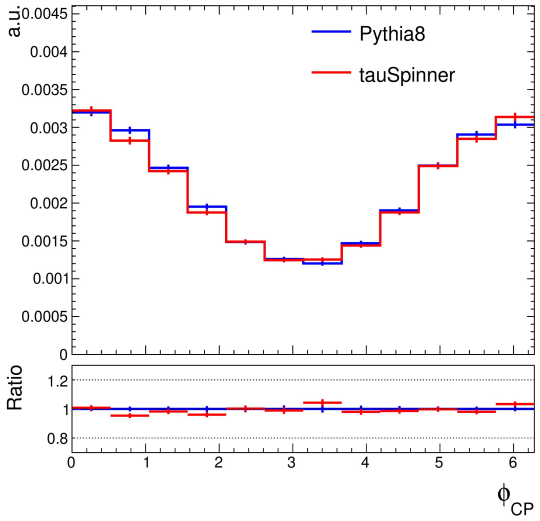


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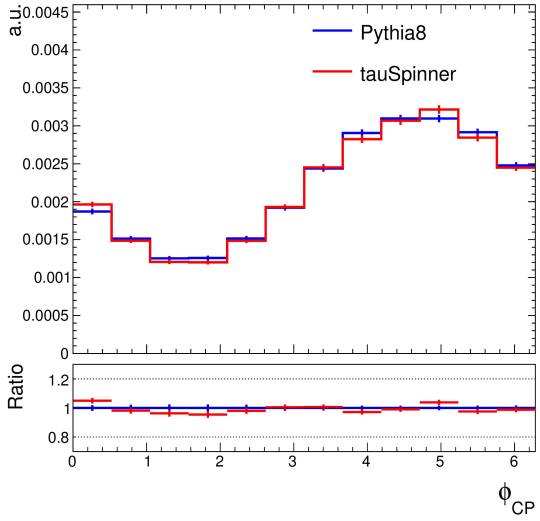


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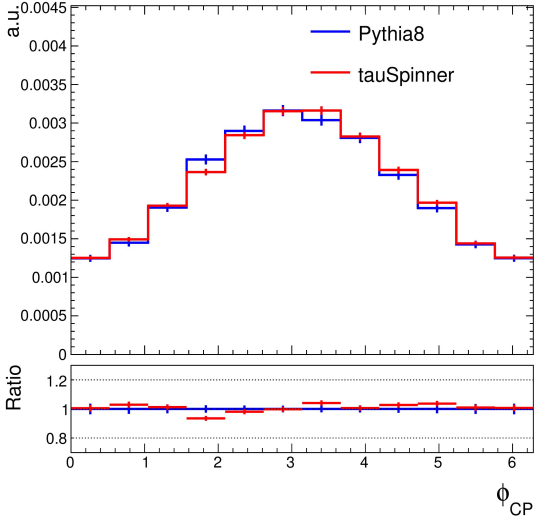


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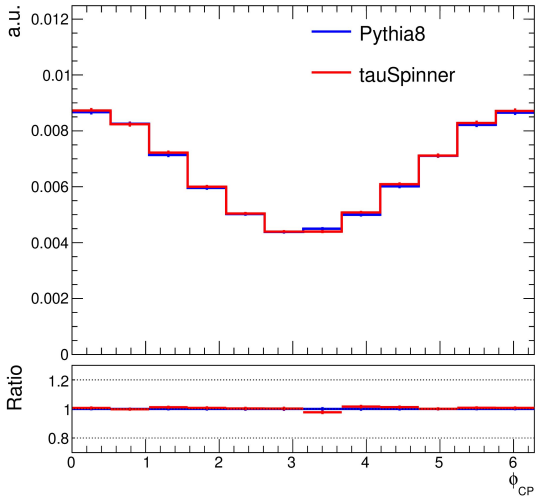


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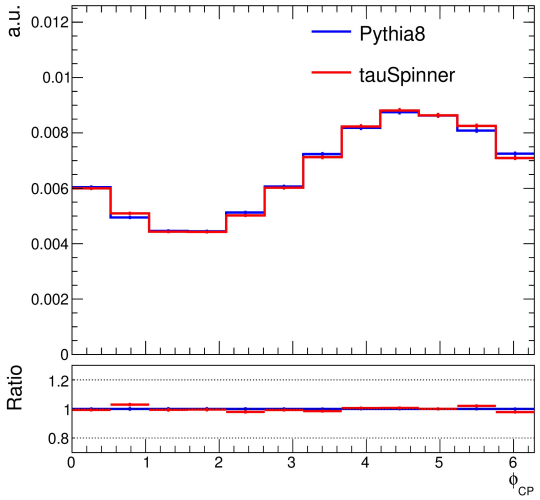


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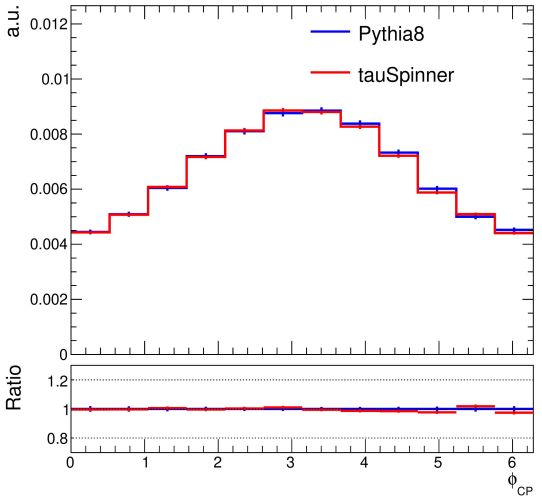


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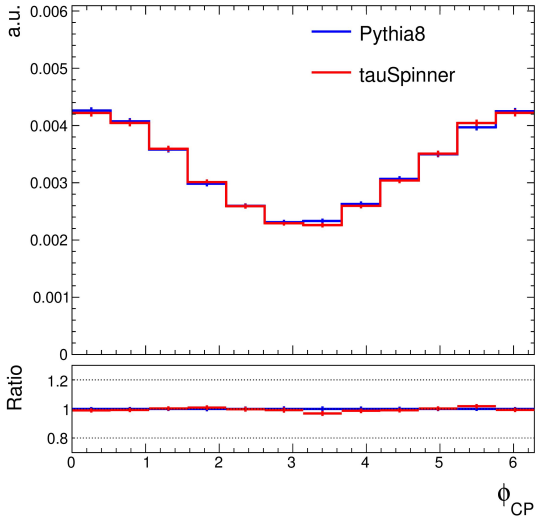


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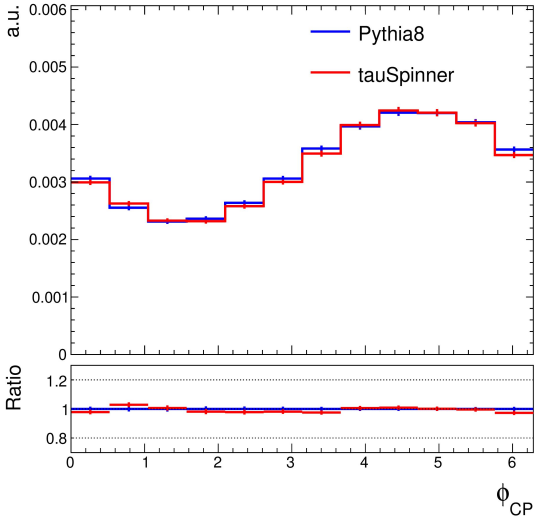


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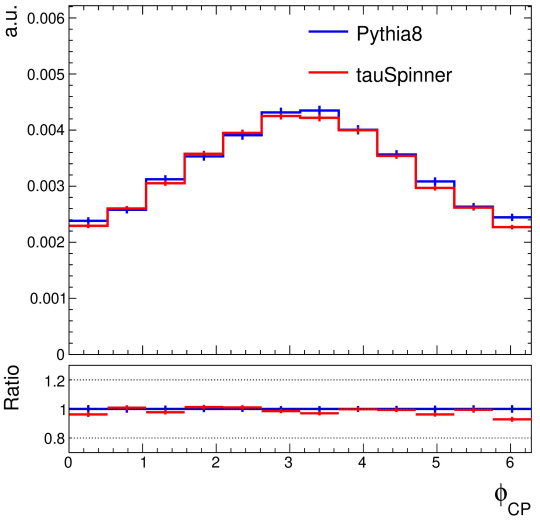


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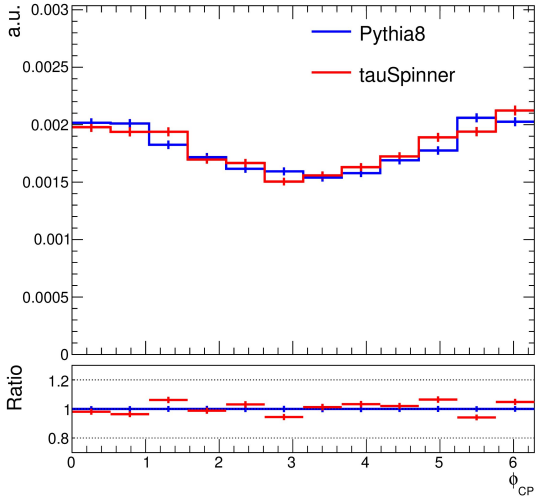


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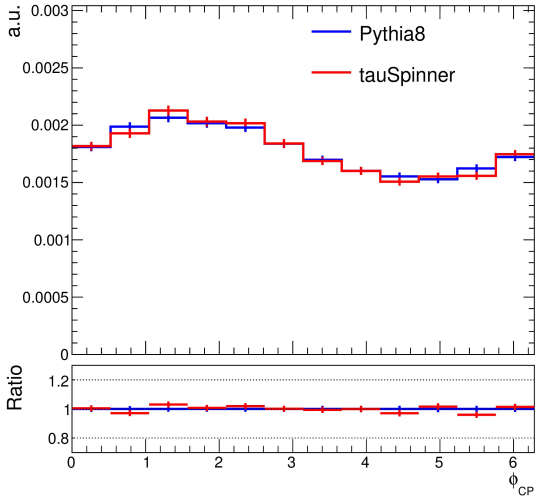


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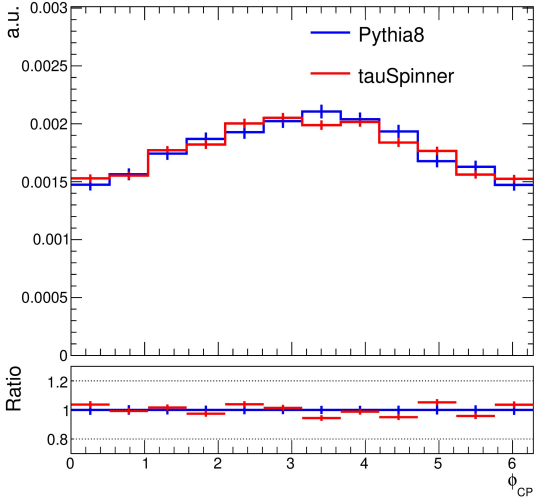


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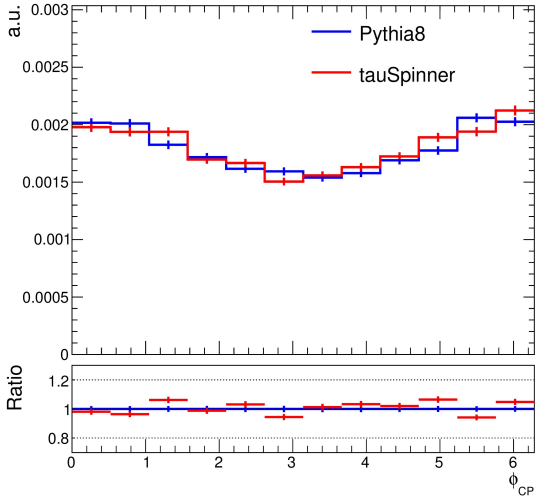


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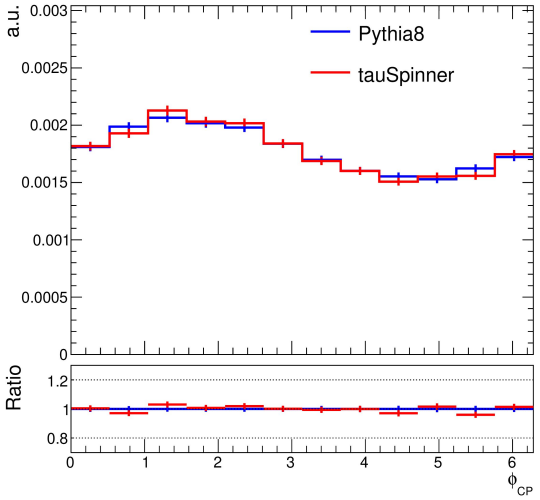


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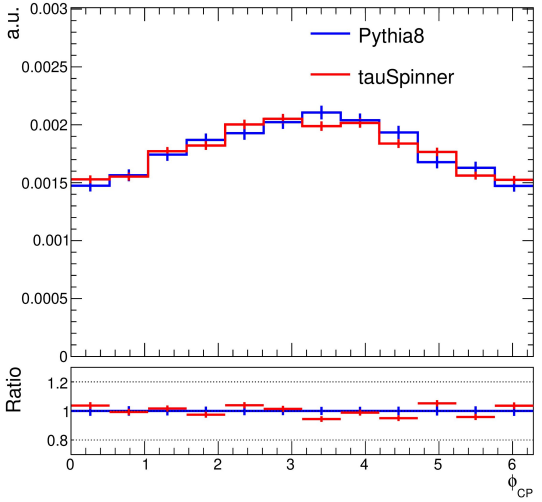


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