Effect of background level on the tracking performance

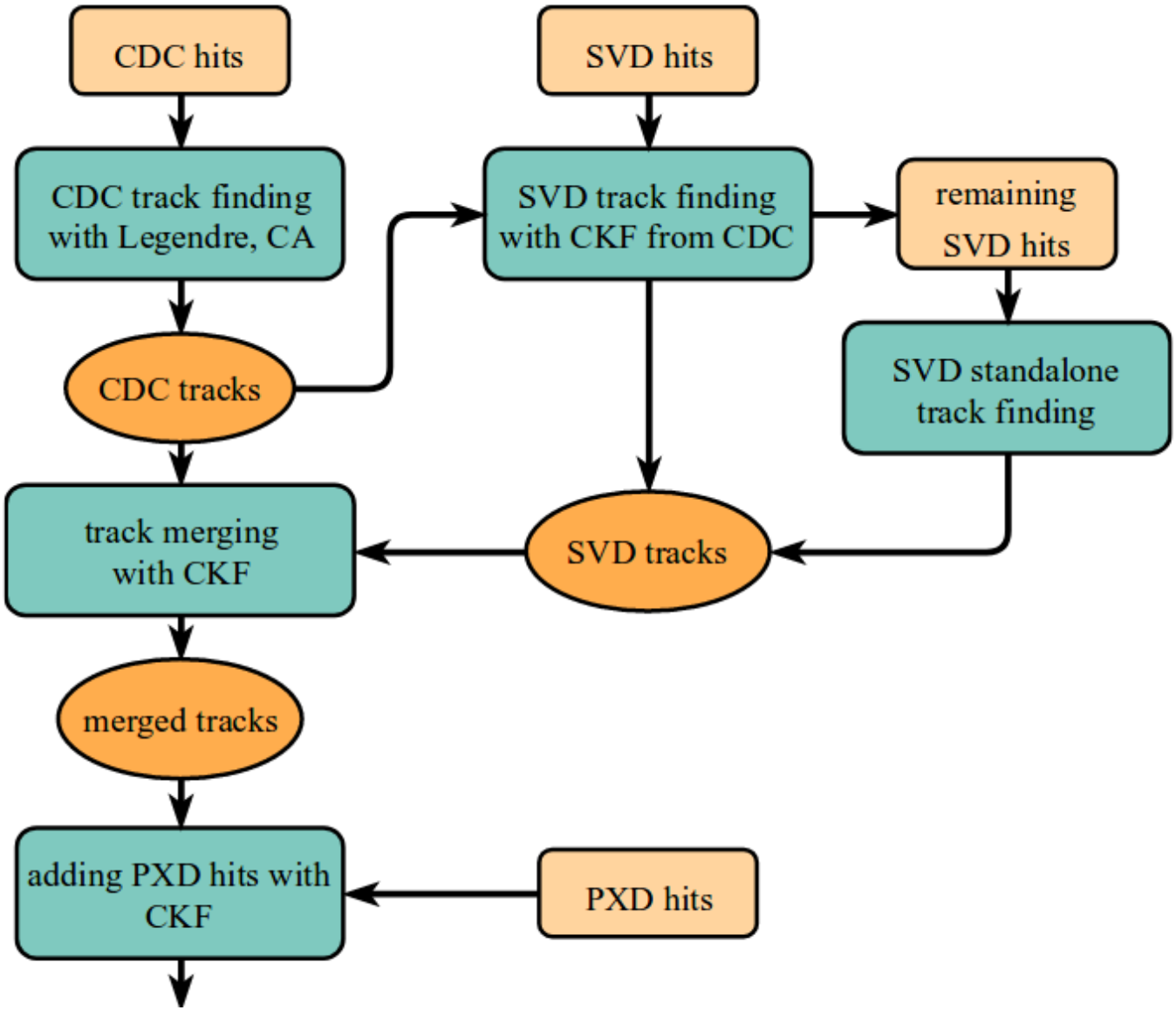
Thomas Lück for the BelleII tracking group,
at the 23rd B2GM

October 11, 2018

SCUOLA
NORMALE
SUPERIORE

outline

Track finding work flow: Full tracking



(Plot by Michael Eliachevitch)

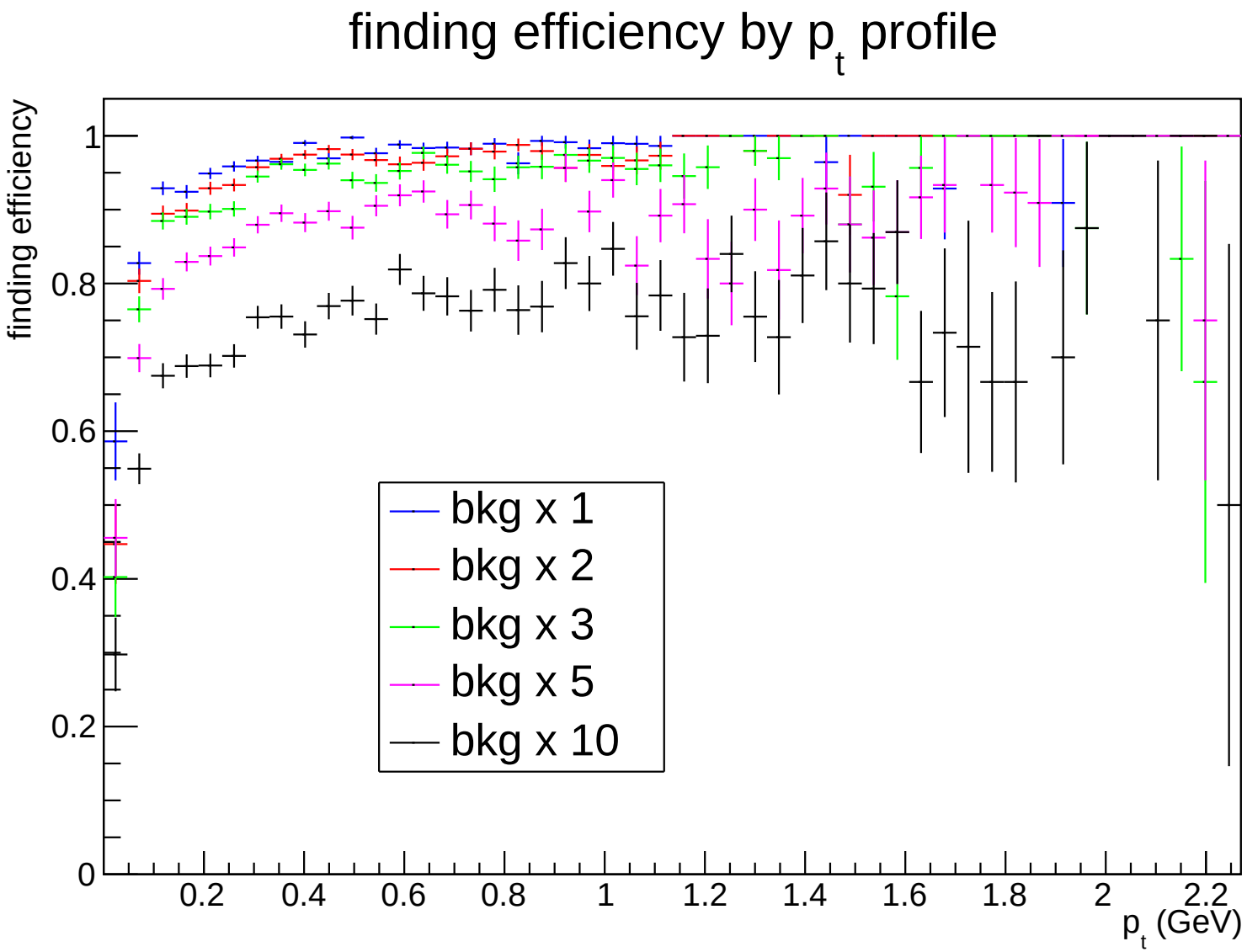
Validation method

- generate 1000 events of $\Upsilon(4S) \rightarrow B\bar{B}$
- use MC-true tracks for normalization:
  - use true information to connect detector hits into a track candidate (TC) $\Rightarrow$ MC-track
  - a reconstructed track candidate is matched to a MC-TC if at least 60% of the contained hits are also contained in the MC-TC
  - finding efficiency: # reconstructed TC matched to MC-TC/ # MC- TC
  - fake rate: # unmatched TC / # total TC

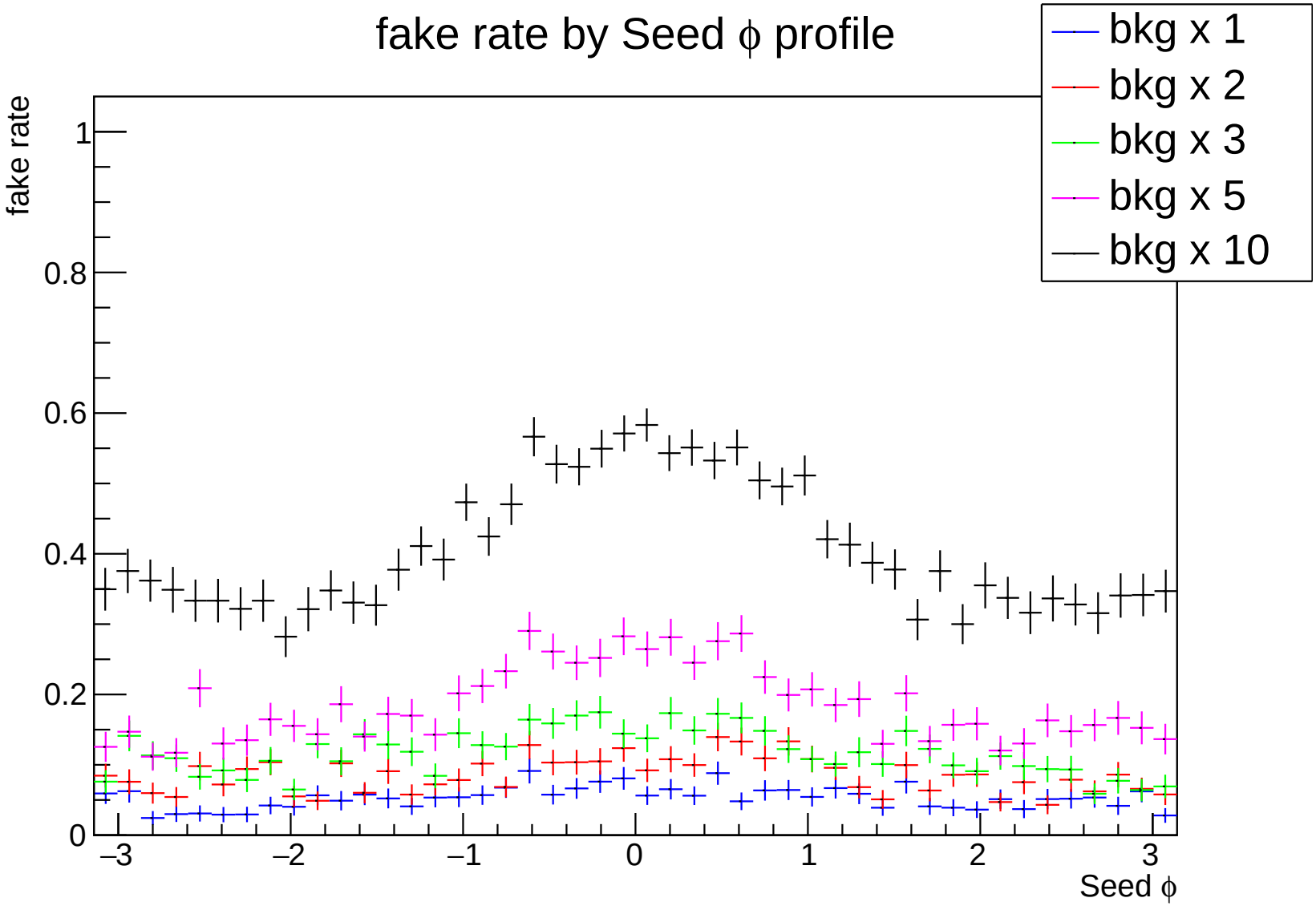
Technical details

- HEAD version of the code (as of October 8th 2018)
- use slightly modified standard tracking validation scripts:
  - use BeamBkgMixer instead of bkg overlay, modified the bkg scale
  - validation/validation/EvtGenSim.py
  - tracking/validation/fullTrackingValidationBkg.py
  - tracking/validation/svdTrackingValidationBkg.py
- bkg files taken from the 15th official bkg campaign:
  - /group/belle2/BGFile/OfficialBKG/15thCampaign/phase3/set0
  - excluded the ECL bkg files
- made changes are on git branch: feature/tracking_bkg_study

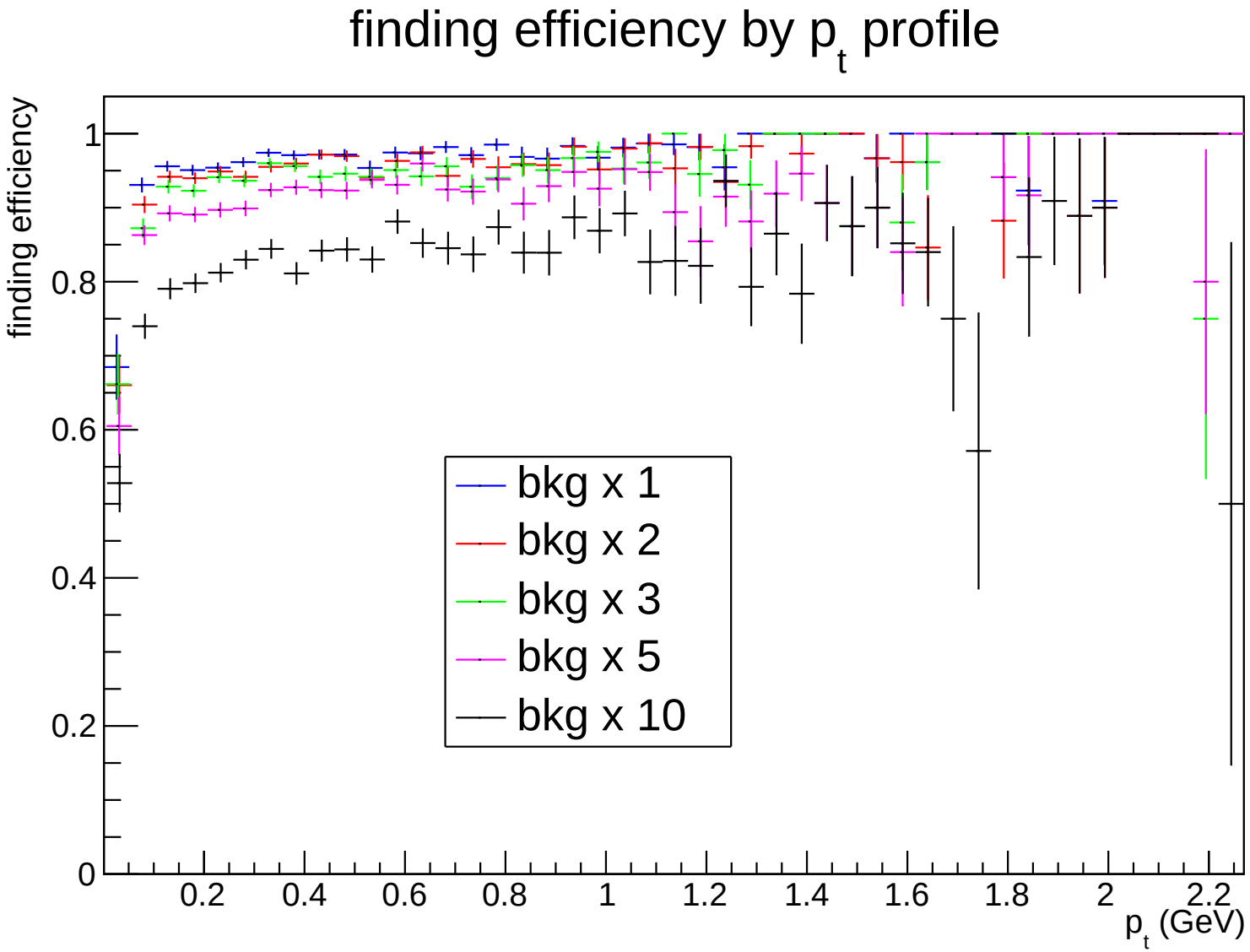
Full tracking chain



Full tracking chain



SVD standalone tracking



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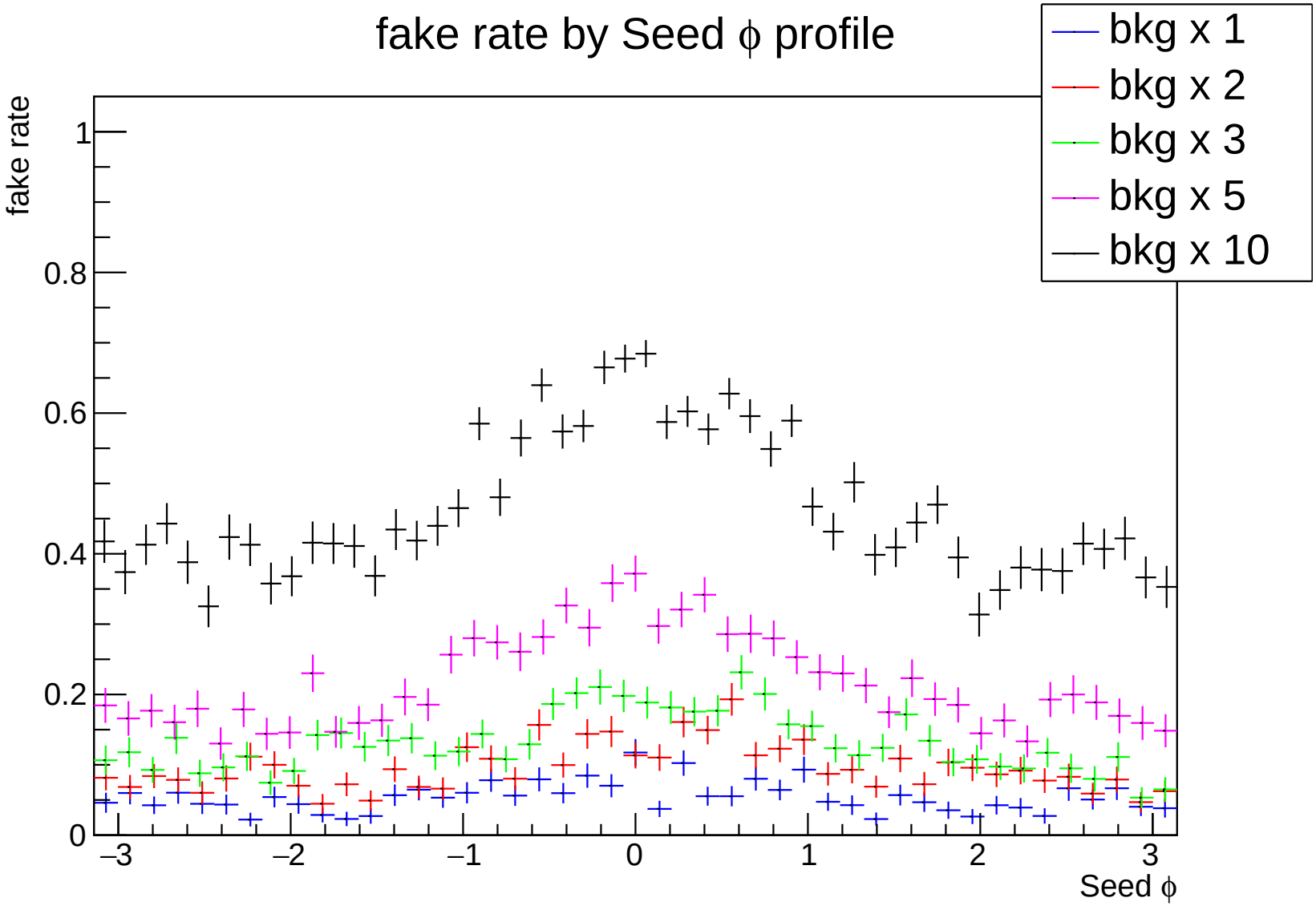


SVD standalone tracking

bkg scale	efficiency	fake rate	hit efficiency	occupancy L3 U/V
bkg x 1	0.961	0.054	0.957	0.013/0.012
bkg x 2	0.946	0.098	0.948	0.023/0.021
bkg x 3	0.935	0.136	0.937	0.032/0.030
bkg x 5	0.907	0.227	0.920	0.052/0.047
bkg x 10	0.819	0.488	0.884	0.102/0.090

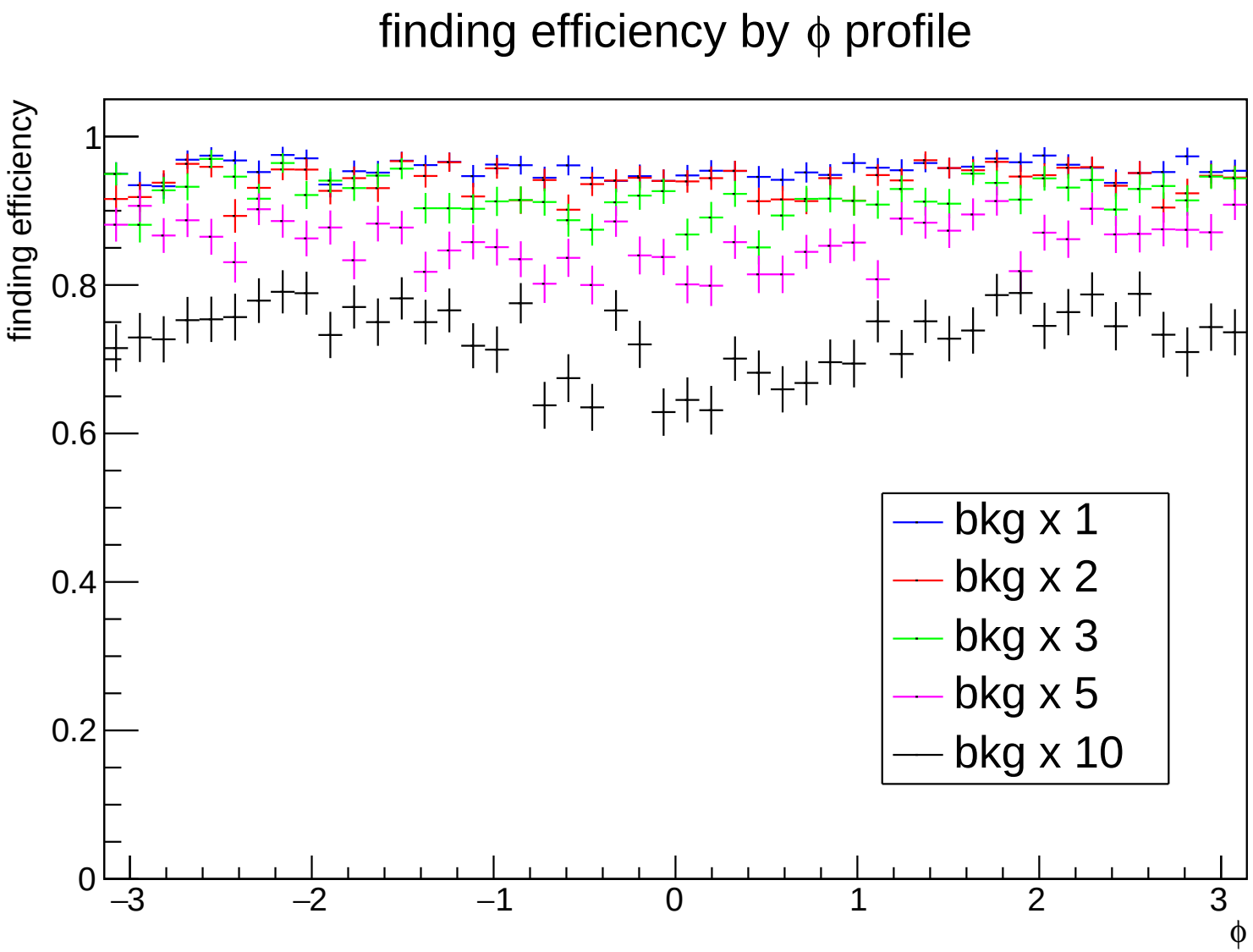
Full tracking chain

bkg scale	efficiency	fake rate	hit efficiency	occupancy L3 U/V
bkg x 1	0.955	0.053	0.818	0.013/0.012
bkg x 2	0.939	0.086	0.744	0.023/0.021
bkg x 3	0.919	0.119	0.635	0.032/0.030
bkg x 5	0.856	0.189	0.422	0.052/0.047
bkg x 10	0.726	0.422	0.407	0.102/0.090

- Note: hit efficiency only on matched TC $\Rightarrow$ biased!
- ave. # tracks in $B\bar{B}$ event $= 11 \Rightarrow$ prob. fully reconstruct $= \epsilon^{11}$:
  - $\epsilon = 0.955 \Rightarrow \epsilon^{11} = 0.603$
  - $\epsilon = 0.939 \Rightarrow \epsilon^{11} = 0.500$

Summary

Full tracking chain



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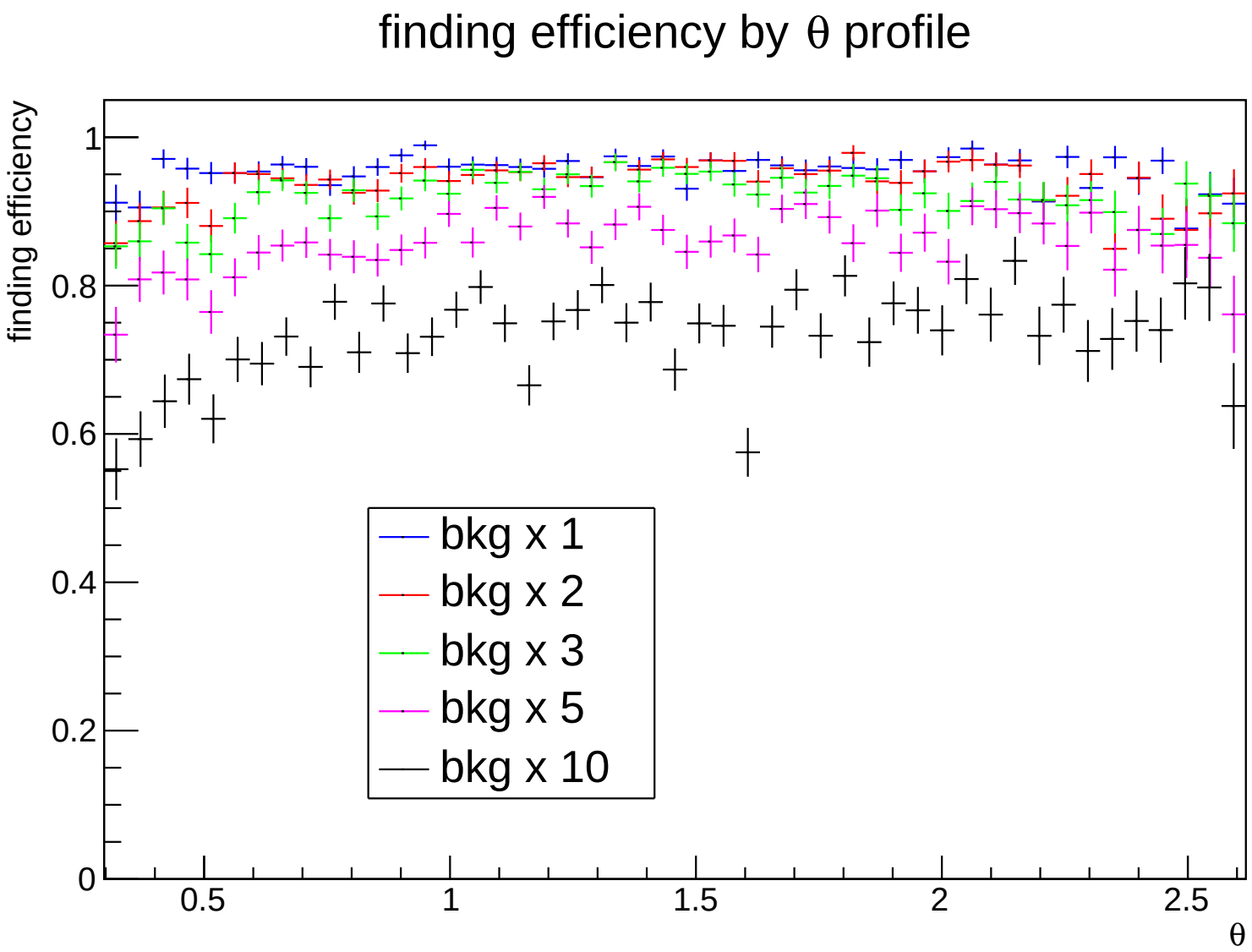

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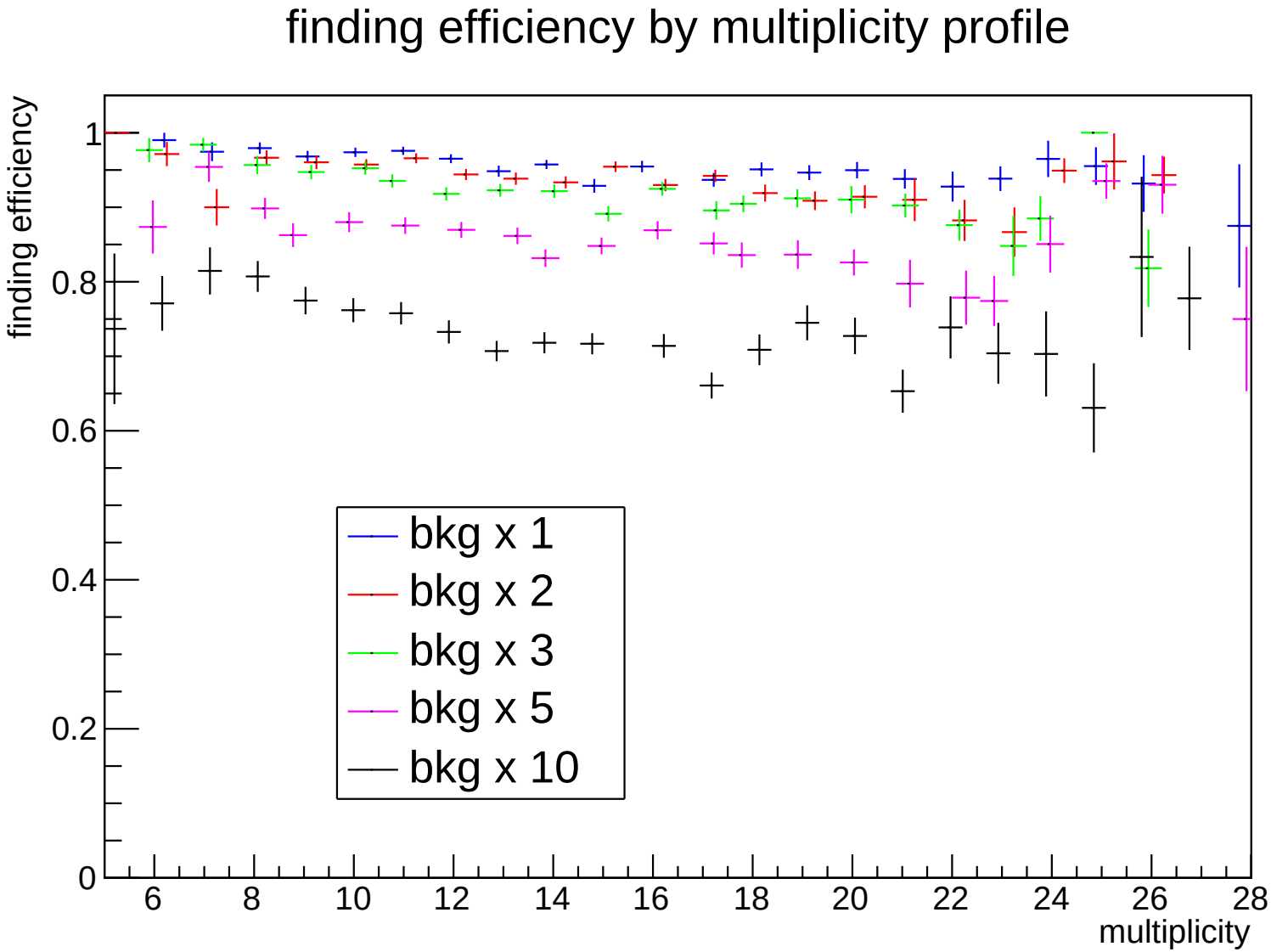

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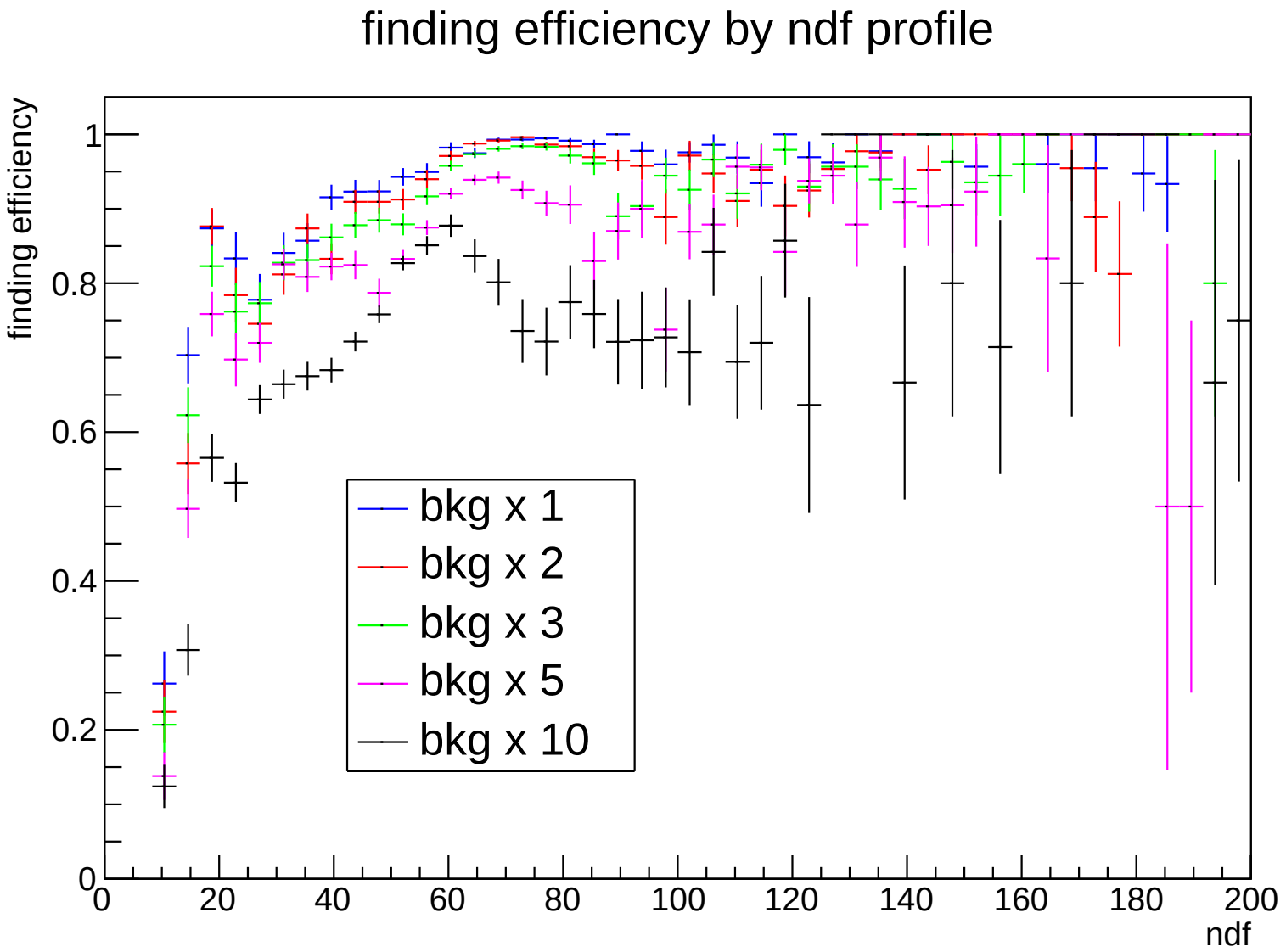

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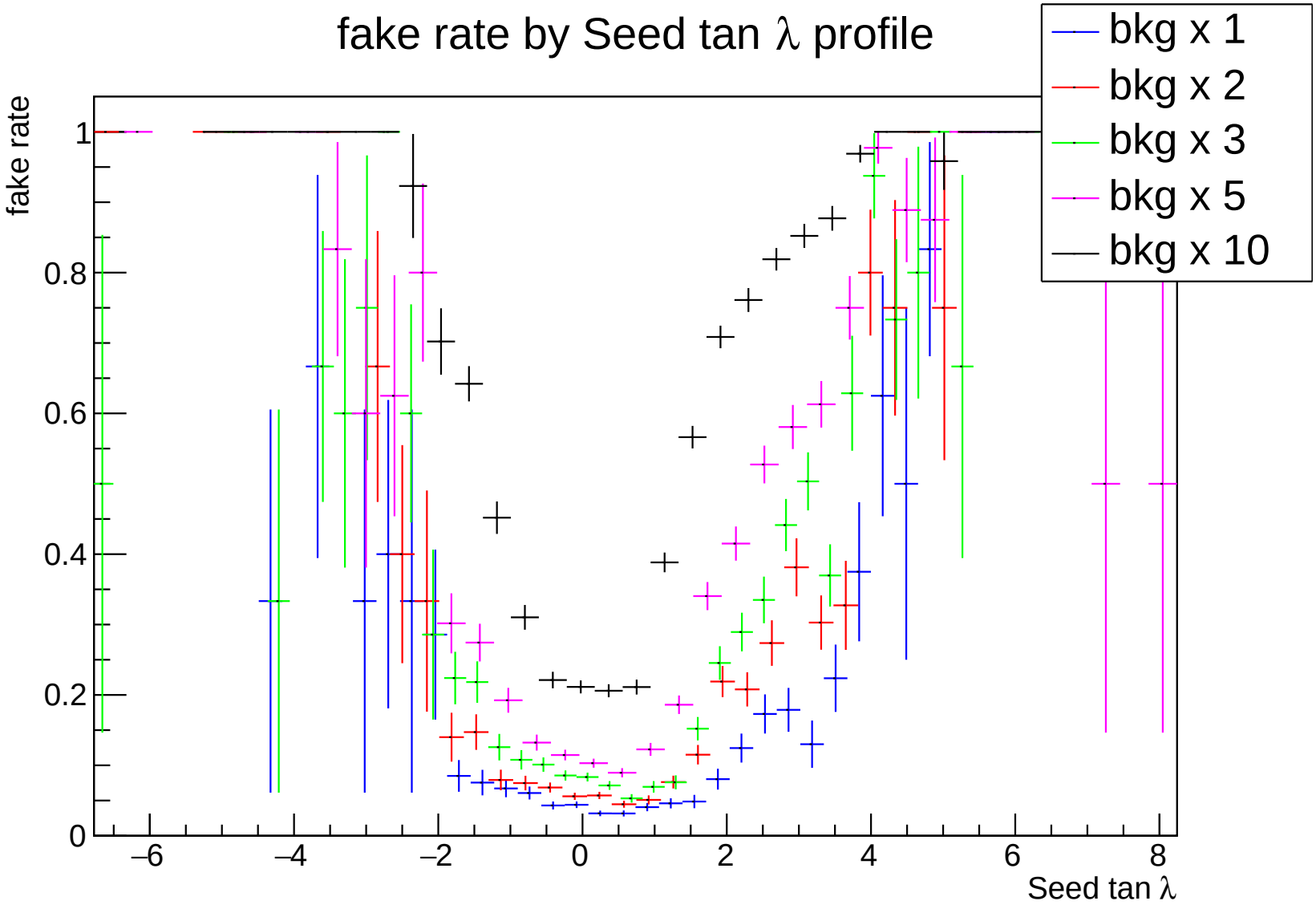

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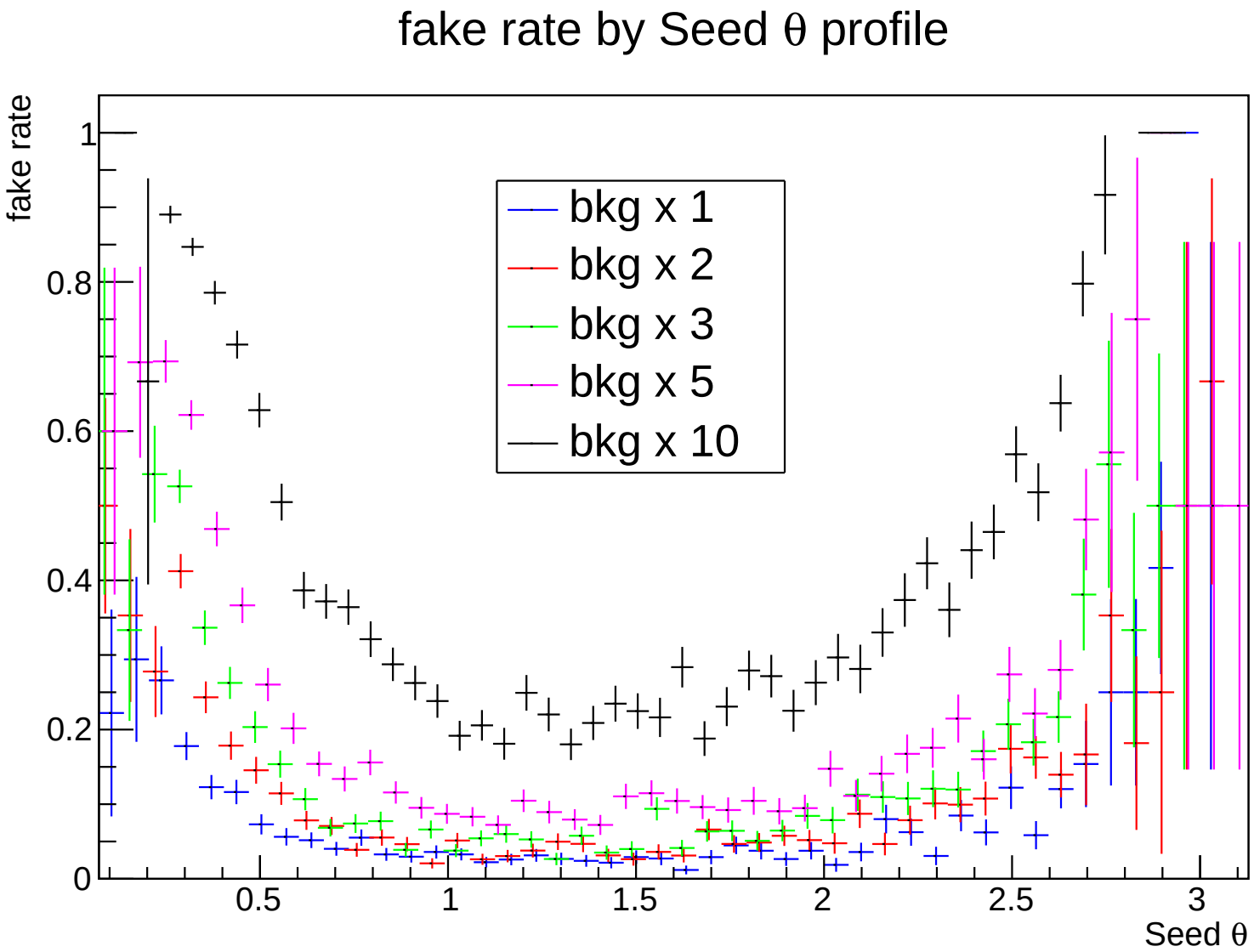

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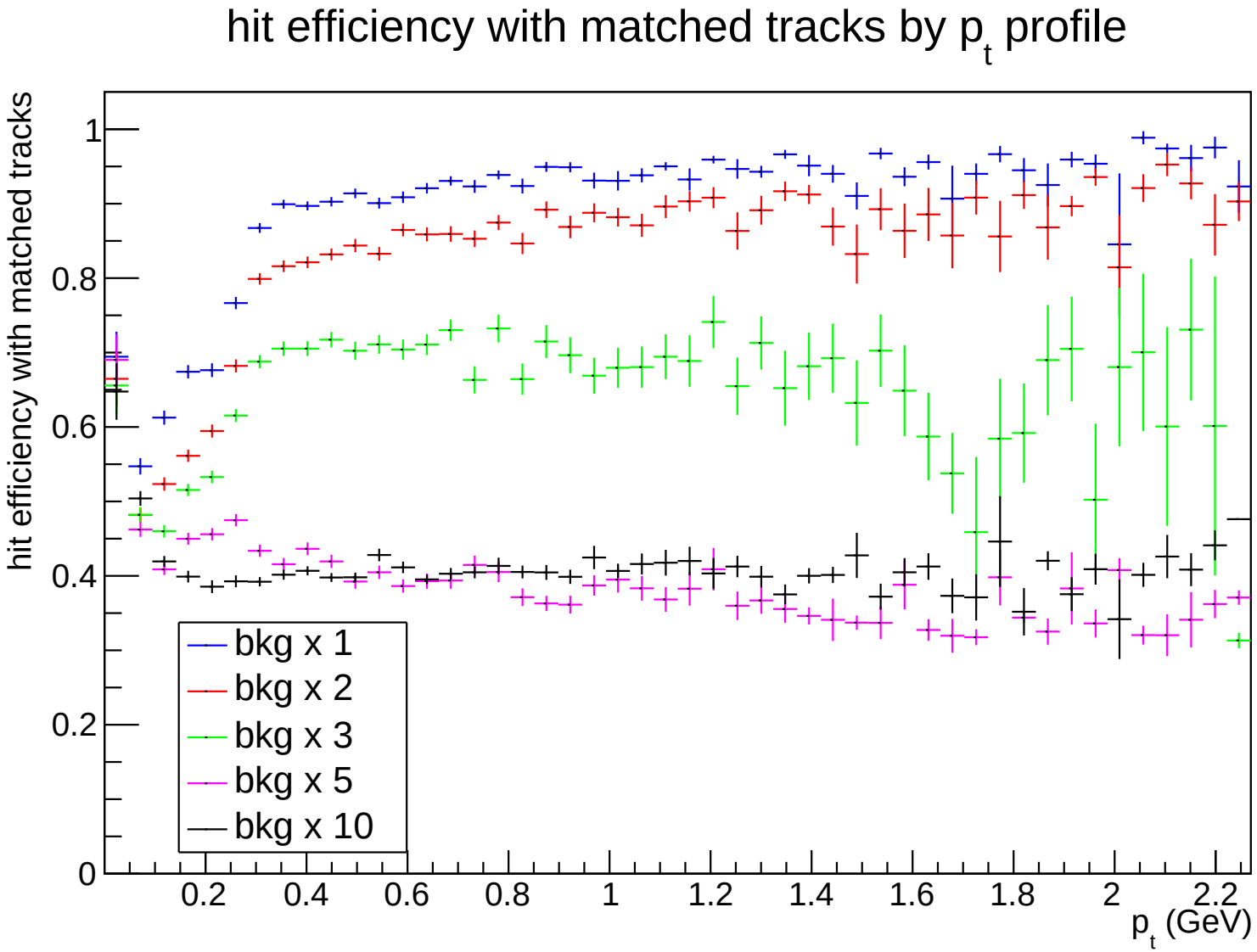

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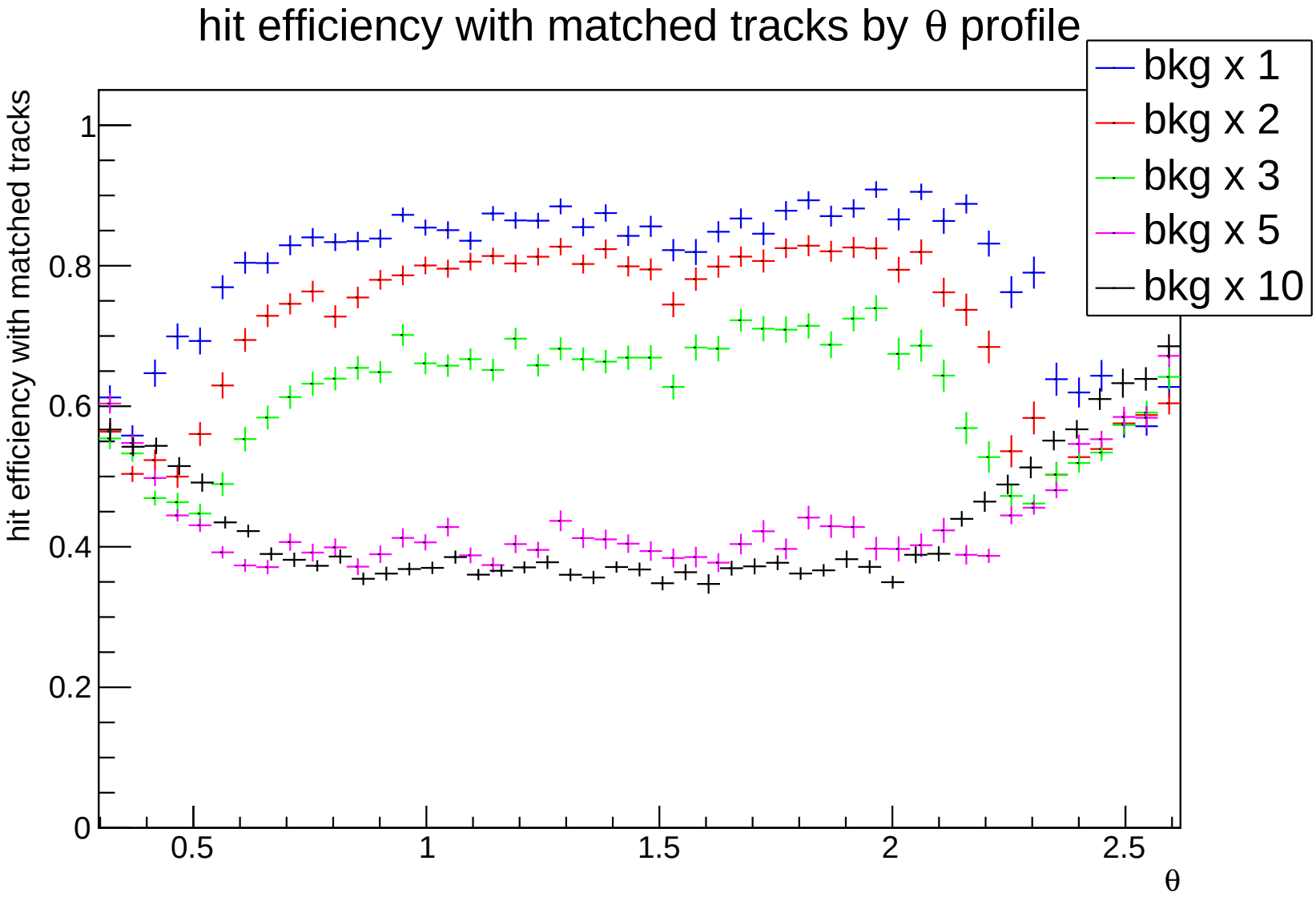

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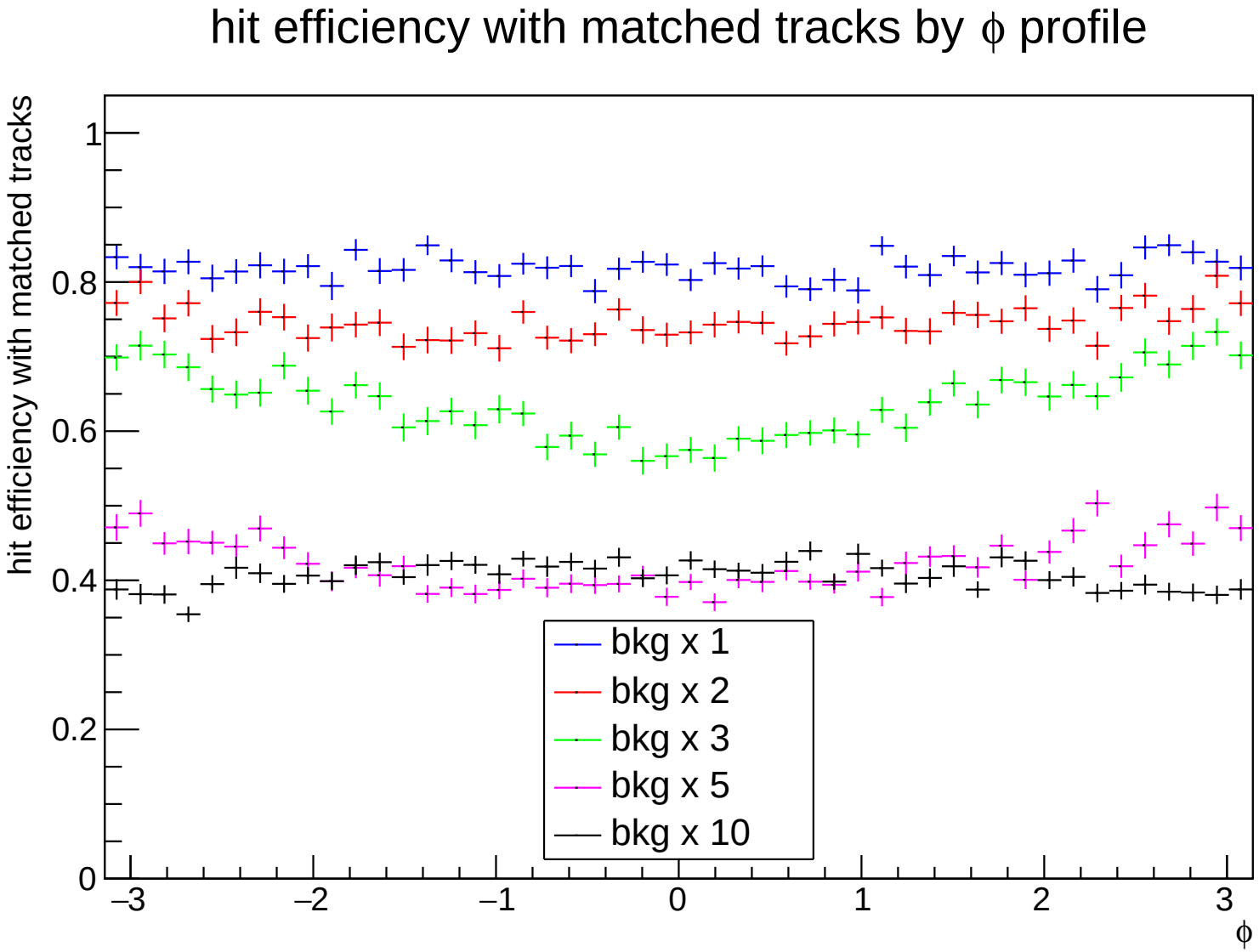
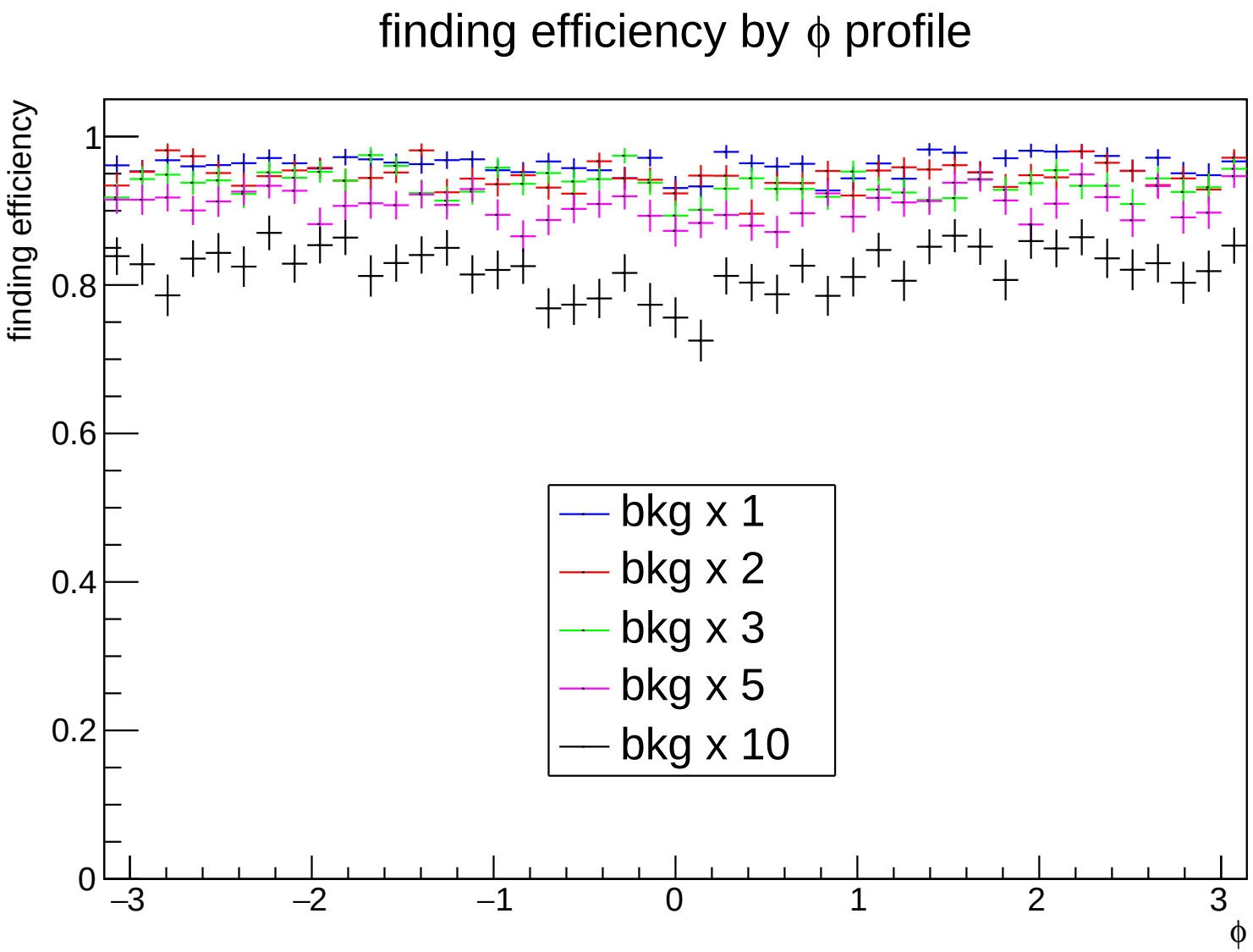


SVD standalone tracking



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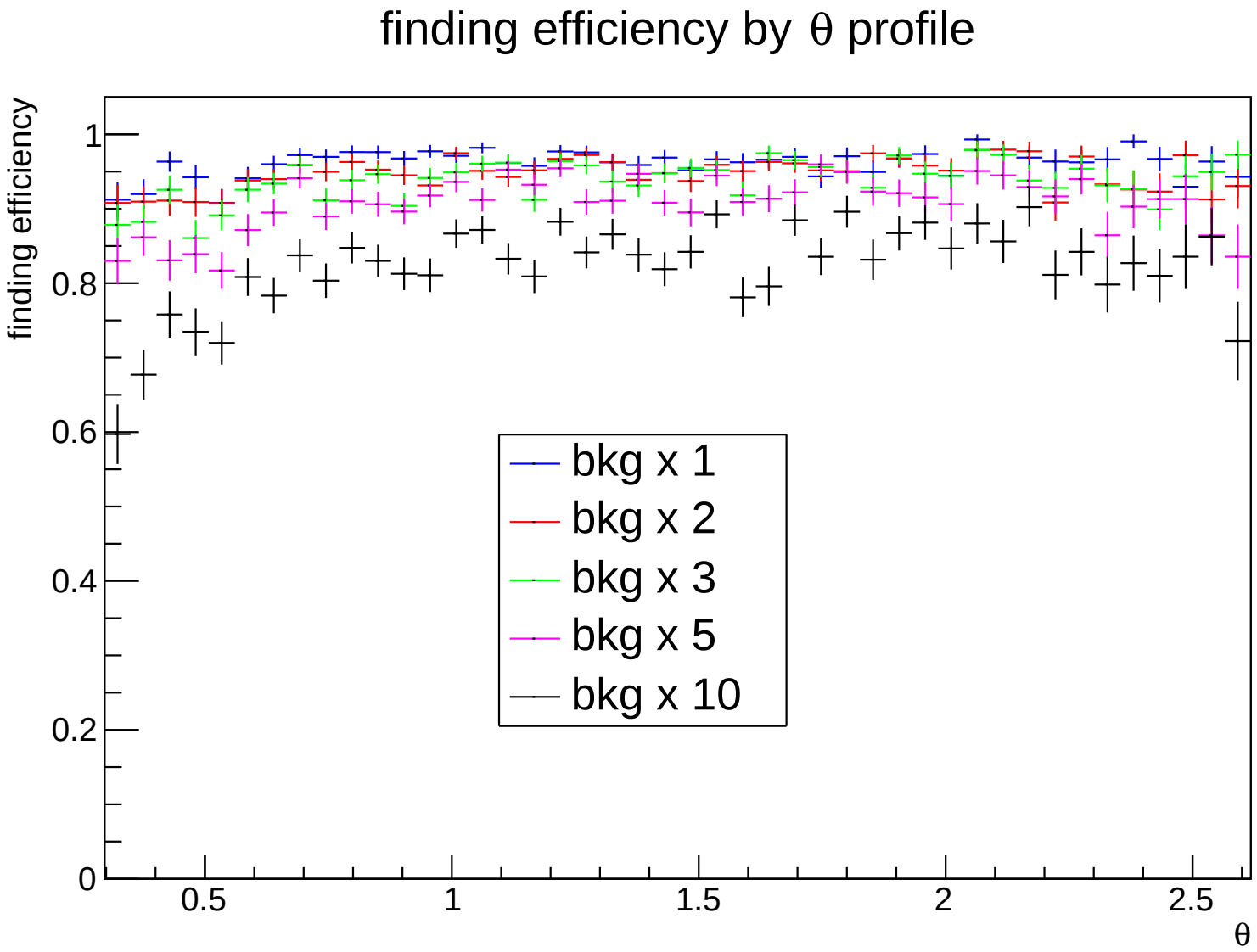

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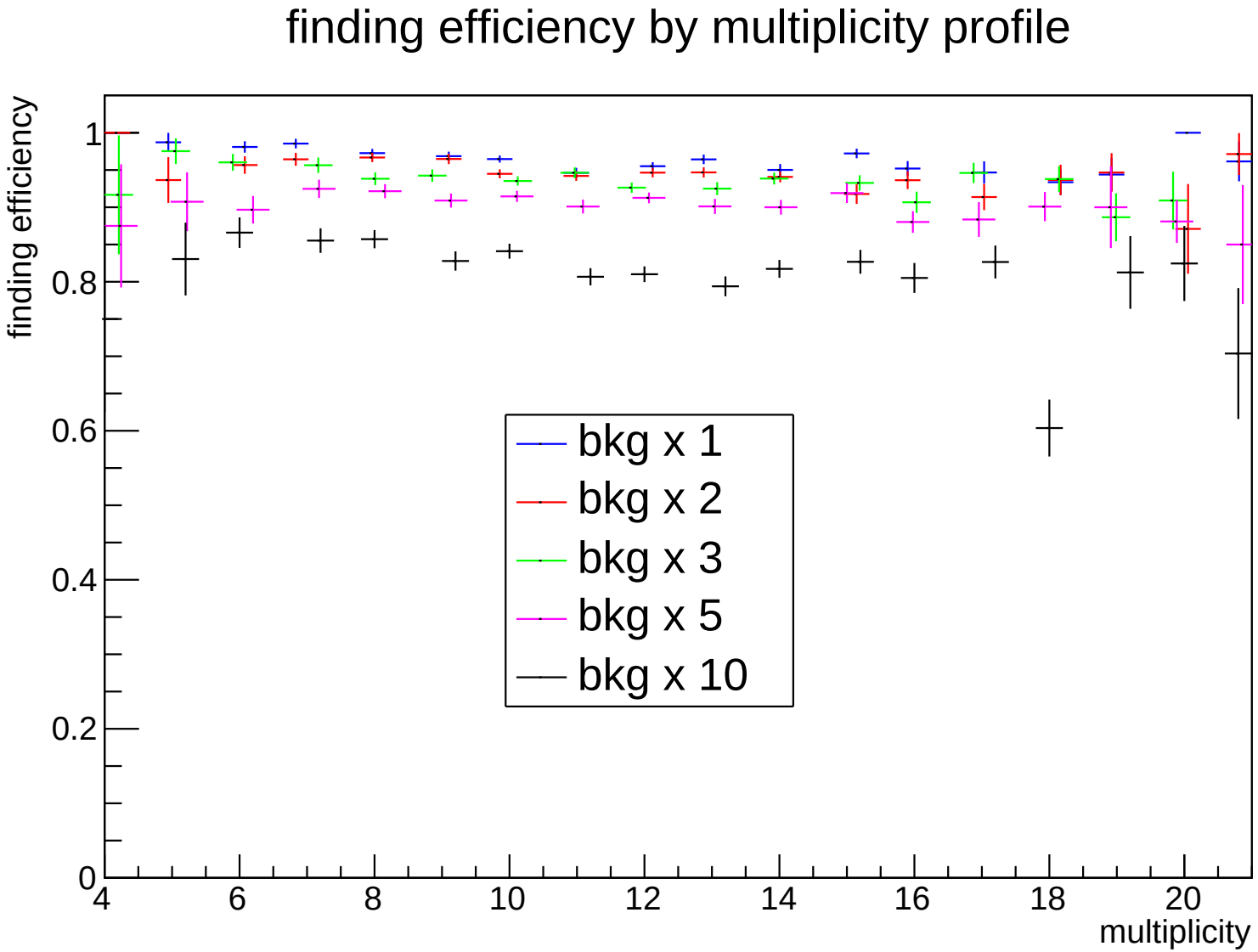

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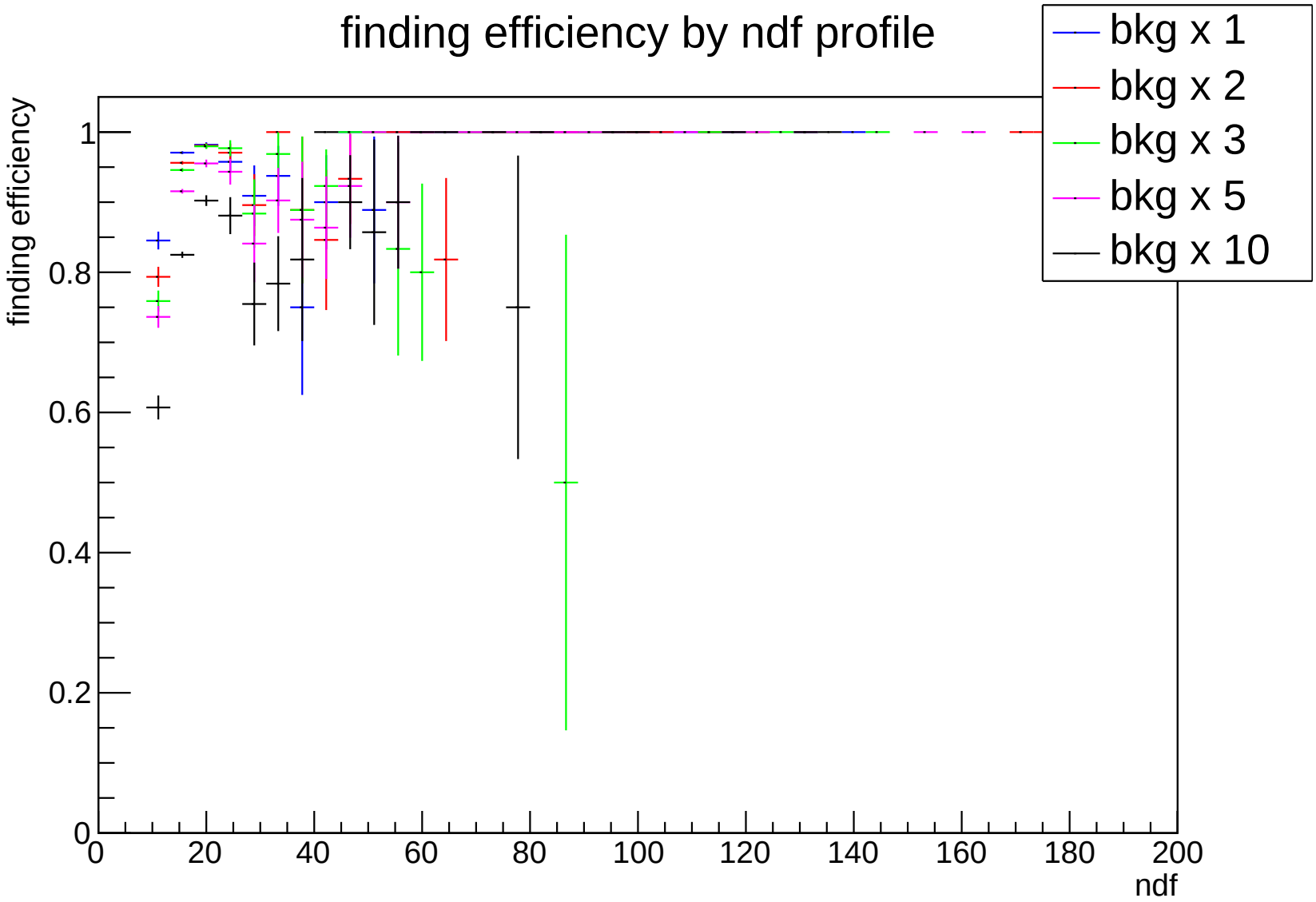

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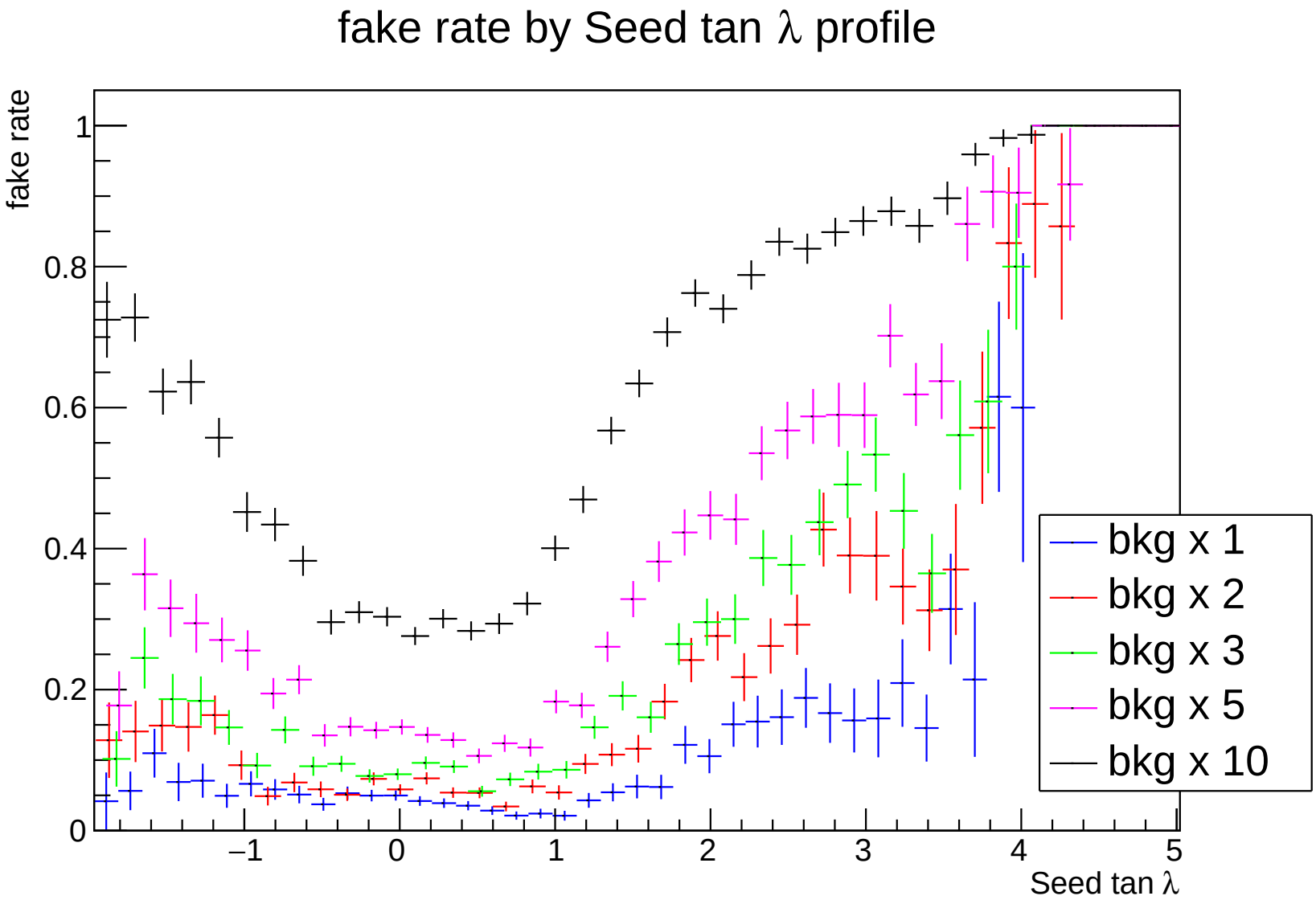

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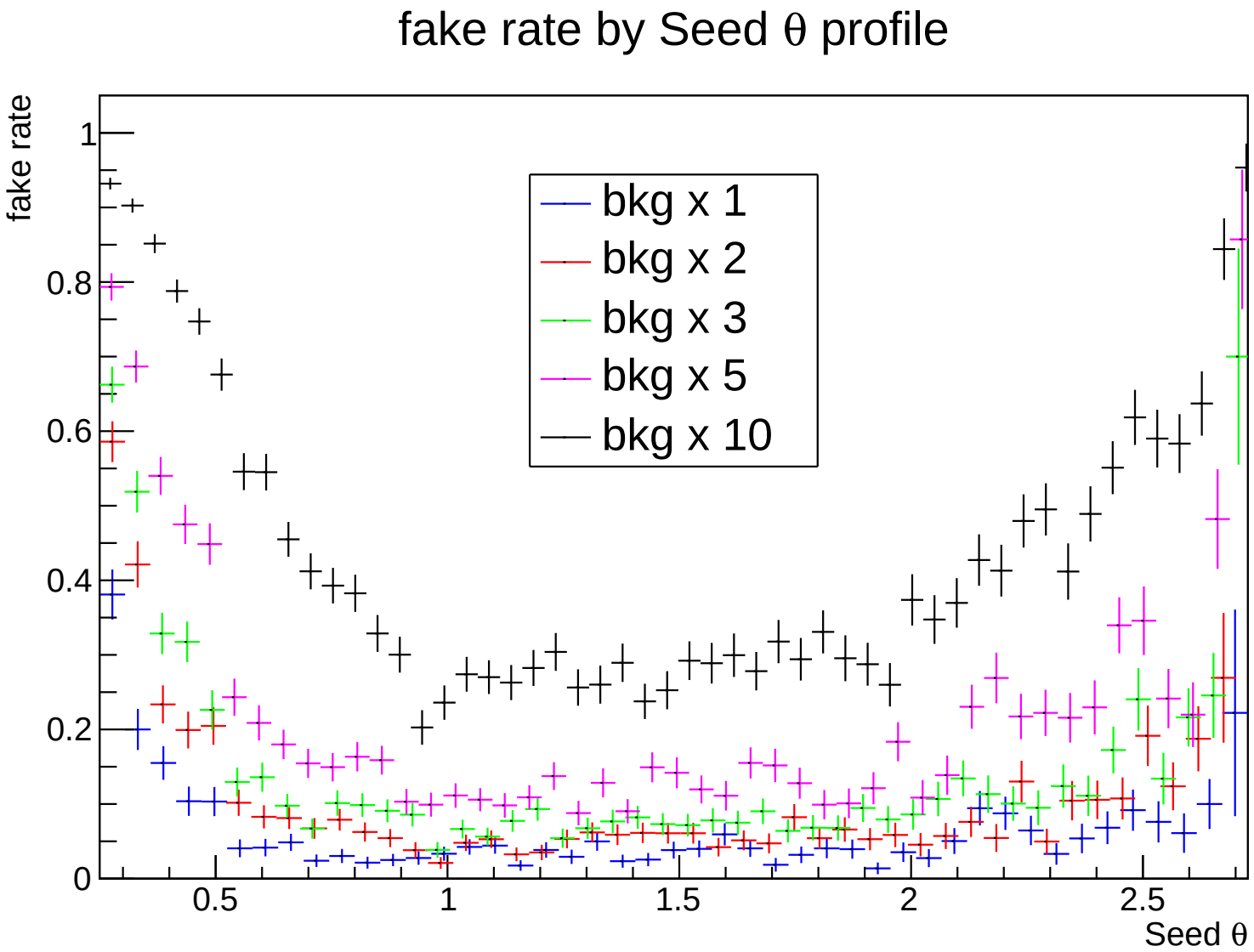

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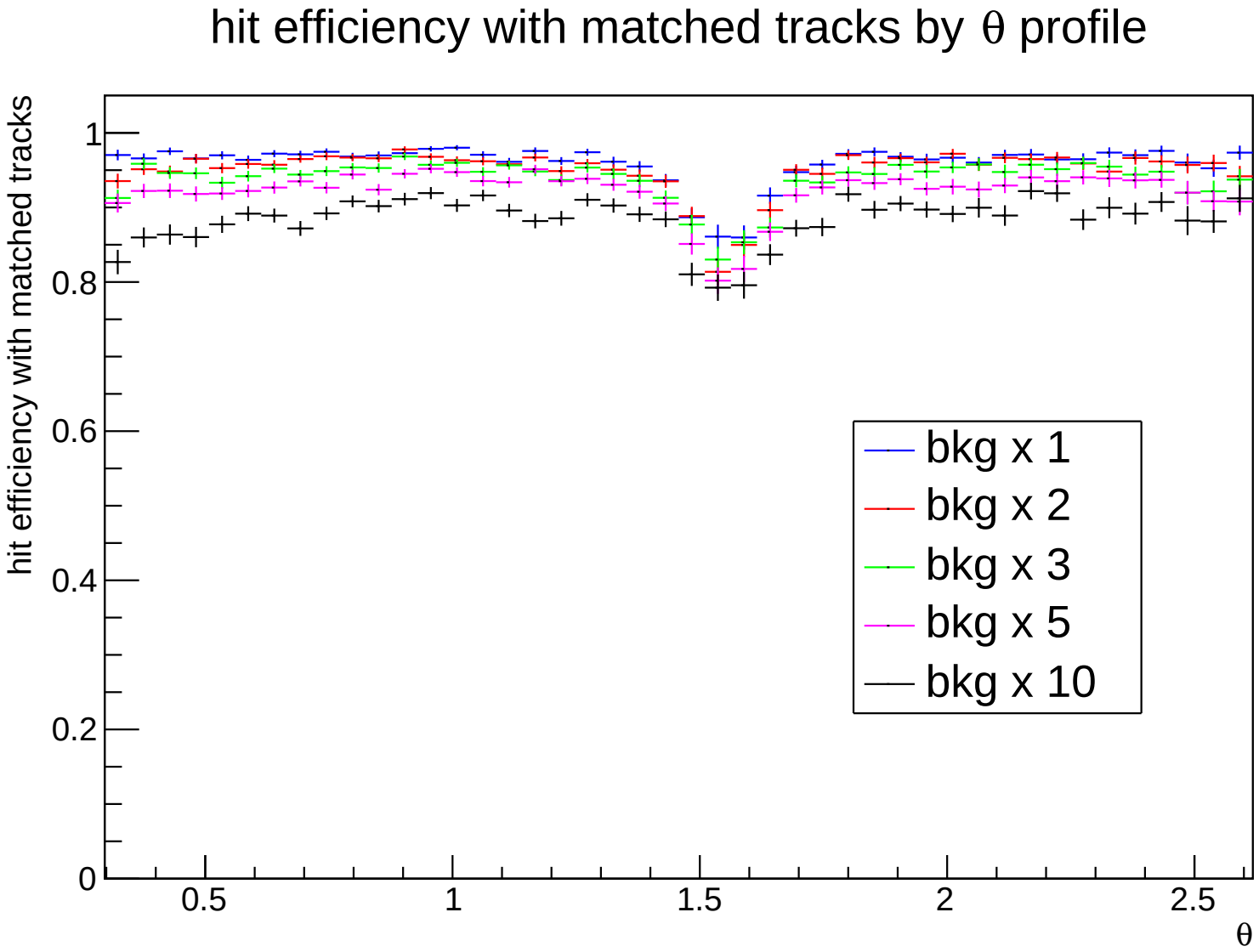

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