Beam-induced background files produced in simulation campaign

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Motivation

- For our previous studies with beam-induced backgrounds, we have been working with locally-produced simulations. Now, we have some simulations produced as part of the official campaign.
- Here, I focus on the 18x275 GeV setting. I check that the SR background production rate is what we expect, and the SVT hit rates are consistent with the locally-produced simulations.
- Once these basic checks are completed for the 18x275 GeV case, I will do similar checks for the 10x275 GeV setting.

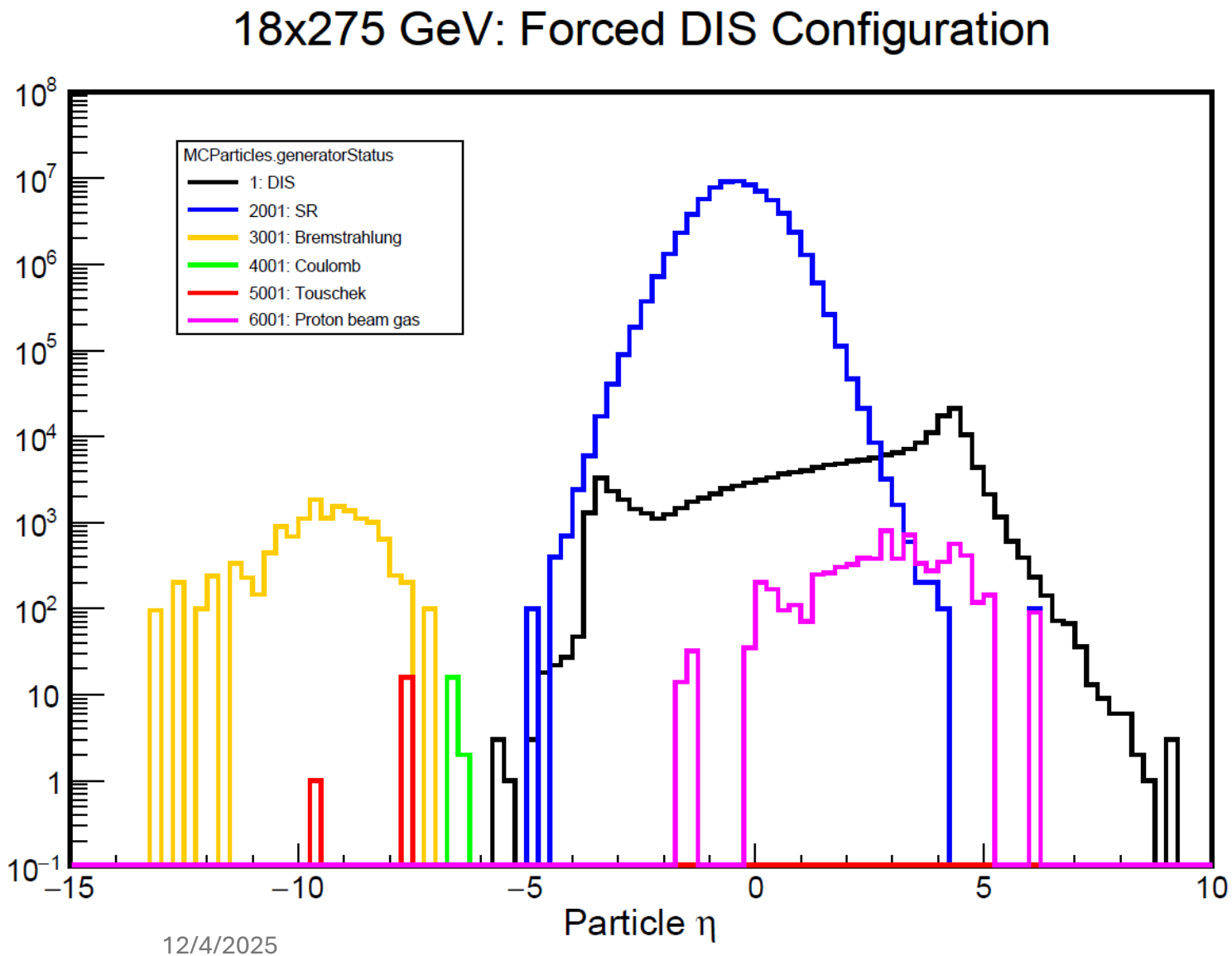
Campaign files

- For the 18x275 GeV setting, the files are here:

  /volatile/eic/EPIC/RECO/25.10.4/epic_craterlake/Bkg_1SignalPer2usFrame/Synrad_18GeV_Vac_10000Ahr_Runtime_50s_Egas_18GeV_Hgas_275GeV/DIS/NC/18x275/minQ2=1

- Each simulated ‘event’ in these files is a 2us long time window.
- These files are produced using a sampling rate of 500 KHz for the DIS collisions. This causes an average of 1 DIS collision per ‘event’. (In the previous local simulations, we placed exactly one DIS collision in each ‘event’.)
- I used 100 files in the above directory for these checks, which corresponds to a total of 10,600 events.

Generated particle distributions in campaign files



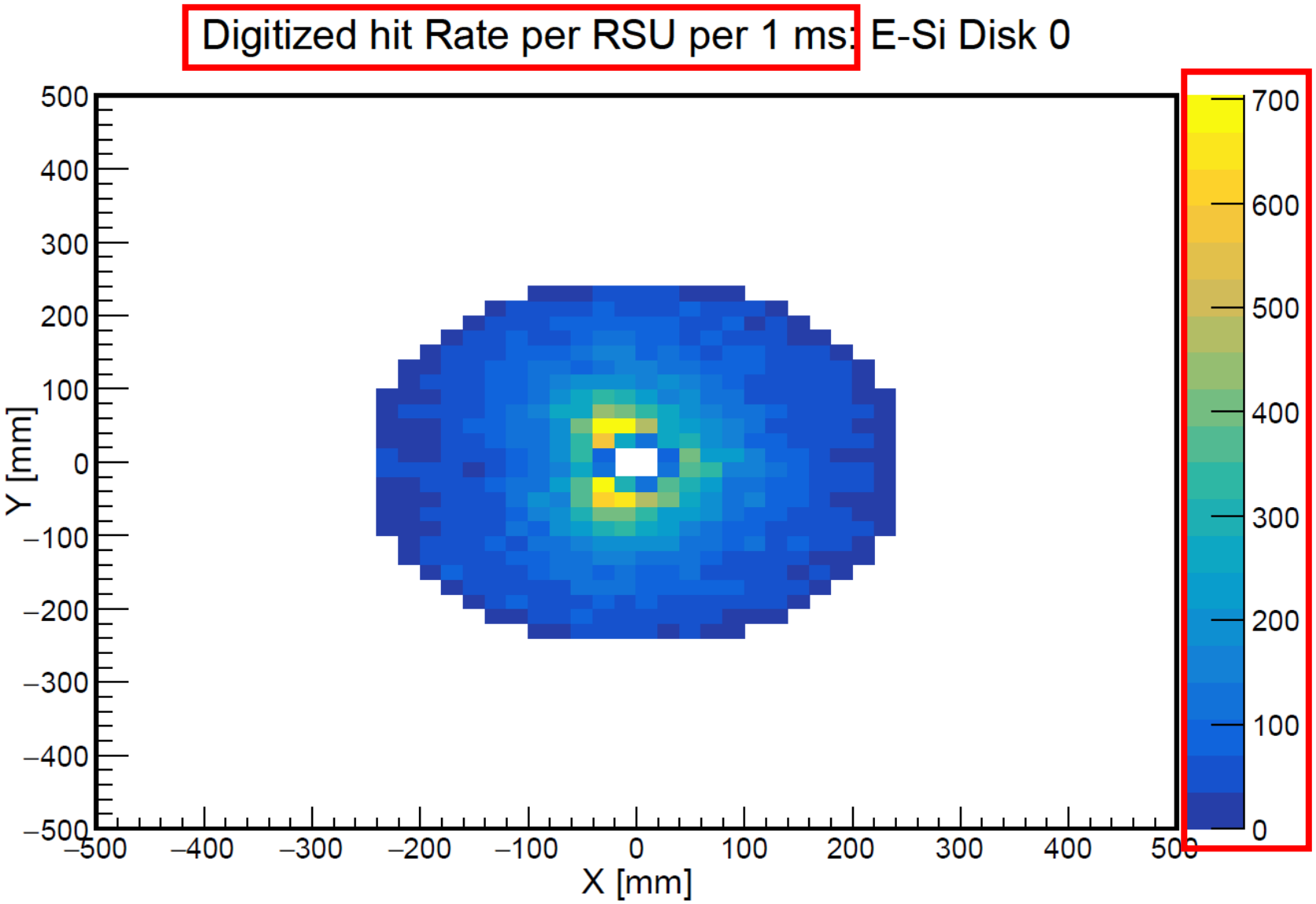
Sanity check for SR rate

Integral of blue histogram = 7.04563×10^{7}

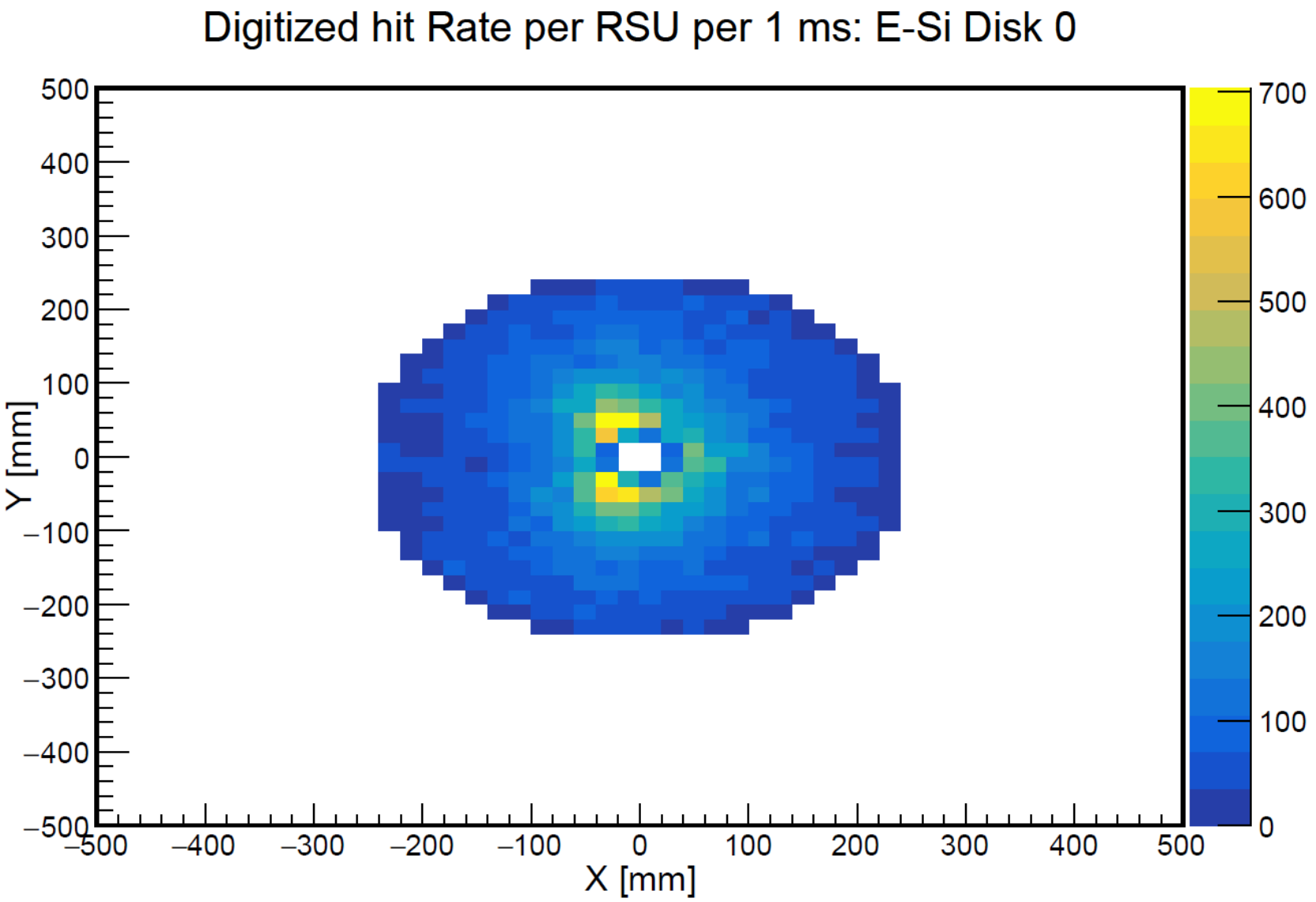
Total time simulated = 2×10^{-6} sec/event x 10600 events = 21.2 ms

SR rate (for photons that exit beampipe) = 3323 MHz

SVT disks digitized hit rate in campaign file: E-Si Disk 0



SVT disks digitized hit rate in campaign file: E-Si Disk 0

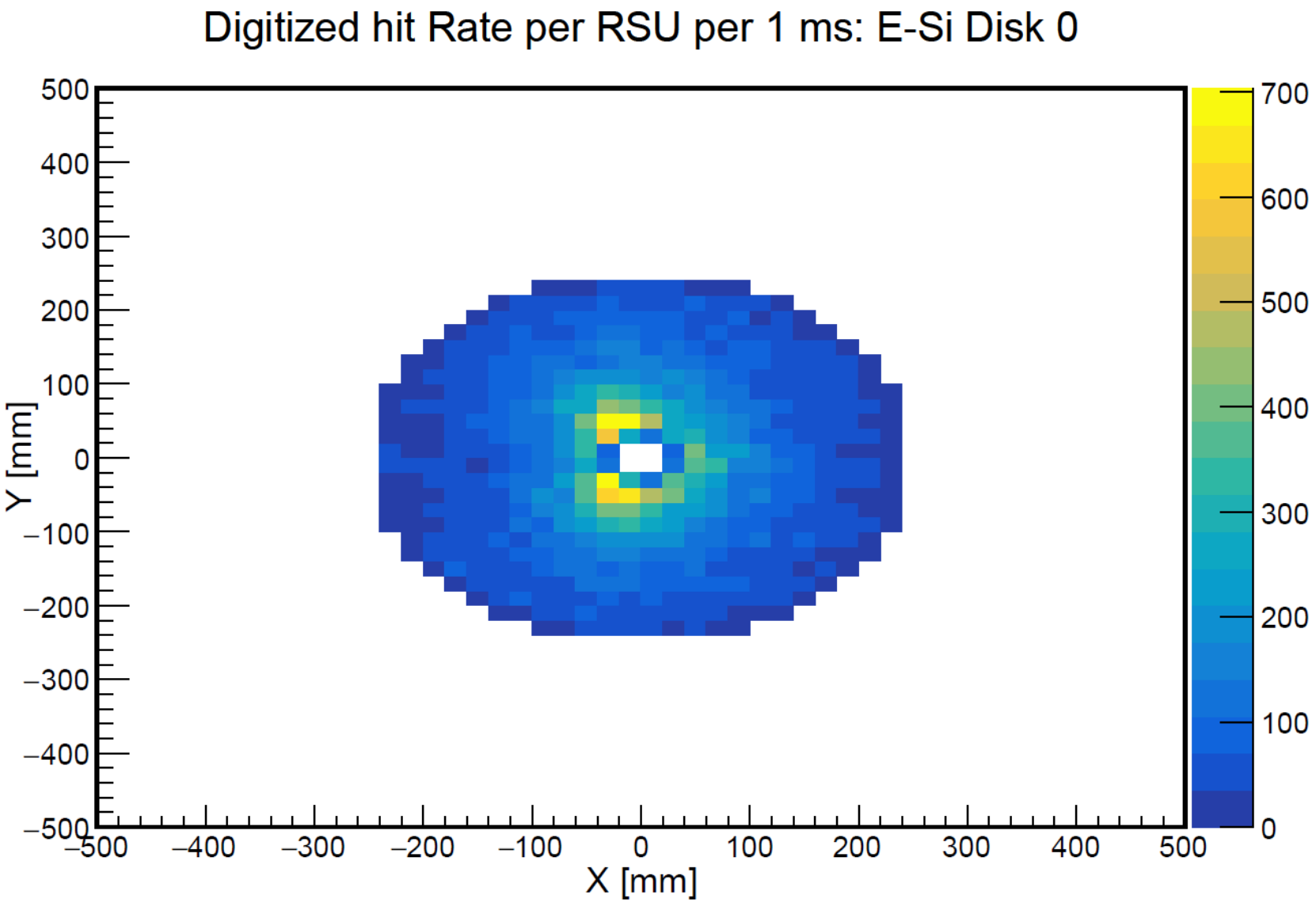


Rate comparison

Simulation Campaign
Total Hits per ms = 49347
Max Hits per RSU per ms = 703

Local Simulation
Total Hits per ms = 49234
Max Hits per RSU per ms = 728

SVT disks digitized hit rate in campaign file: E-Si Disk 0



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All other SVT layers also show consistent hit rates for campaign files and local simulation

Conclusions

- For the 18x275 GeV (1 DIS collision on average) configuration, files are now available as part of the official simulation campaign. Thanks, Sakib!
- The SR rate in these files is what we expect, and SVT hit rates are consistent with local simulation results.
- I was able to analyze ~10,000 events from the campaign. More events are available, and these can be used for the tracking and physics studies.
- Campaign files for 10x275 GeV are being produced now. I will have a similar set of checks for those next week.