

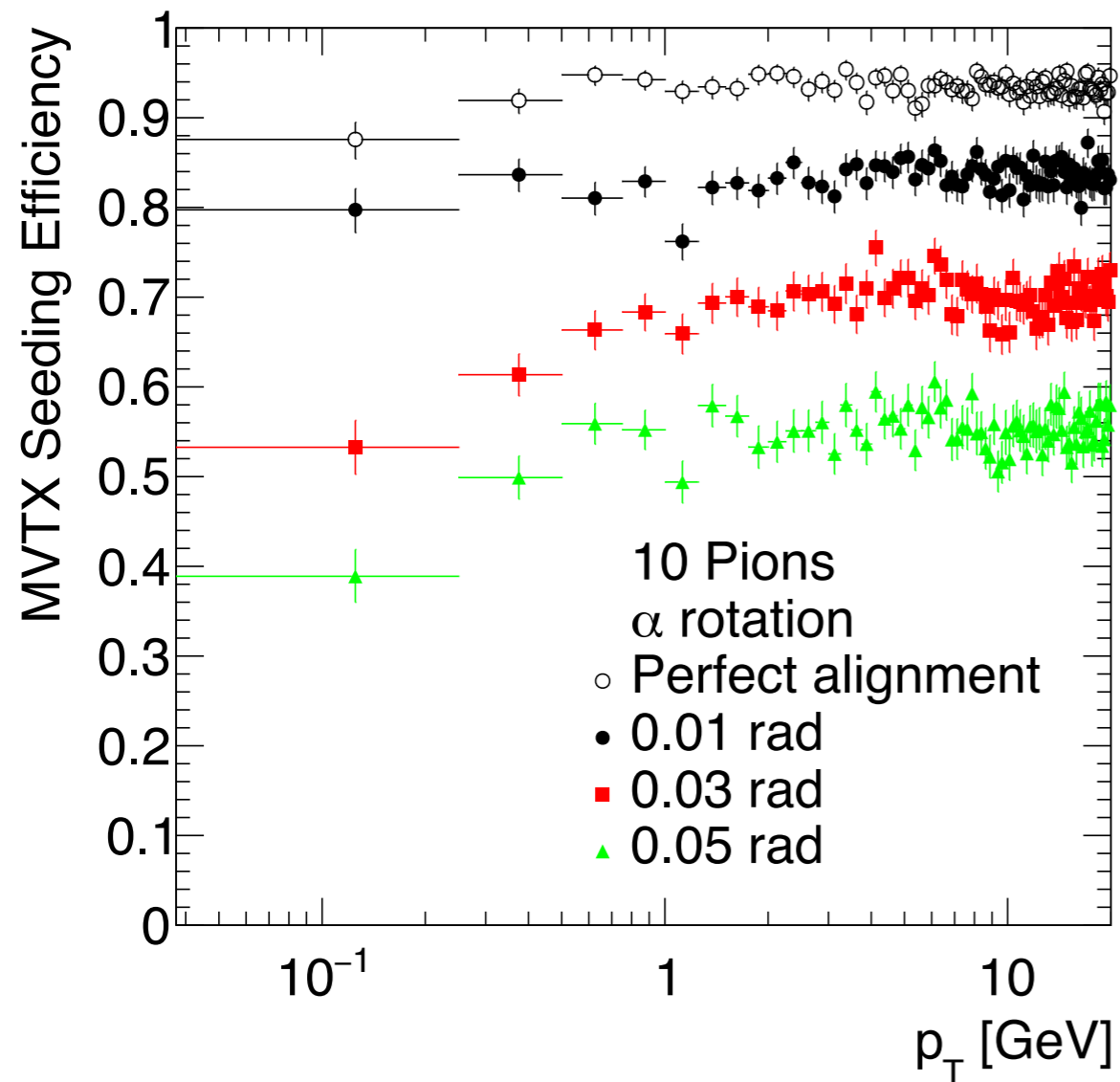
Silicon Seeding and Misalignment

Joe Osborn
October 11, 2022

Overview

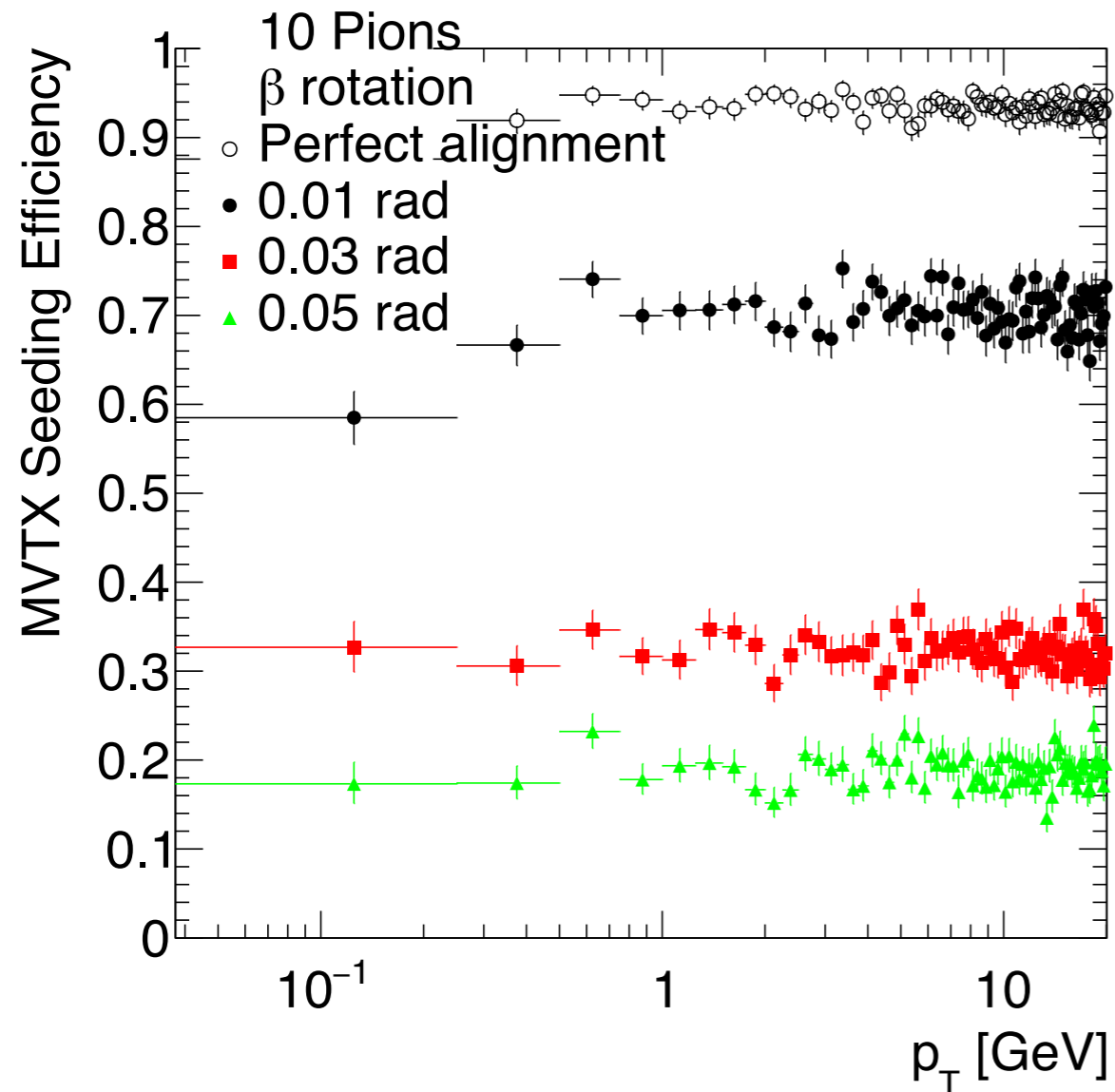
- Open question: can the Acts seeder be used in an MVTX with misalignment? If so, to what degree?
- Pulled Reese's code down from https://github.com/rboucher43/coresoftware/tree/randomized_global_alignment
- Ran 10 pion events with various misalignments in only 1 (translation, rotation) at a time

MVTX Seeding Efficiency



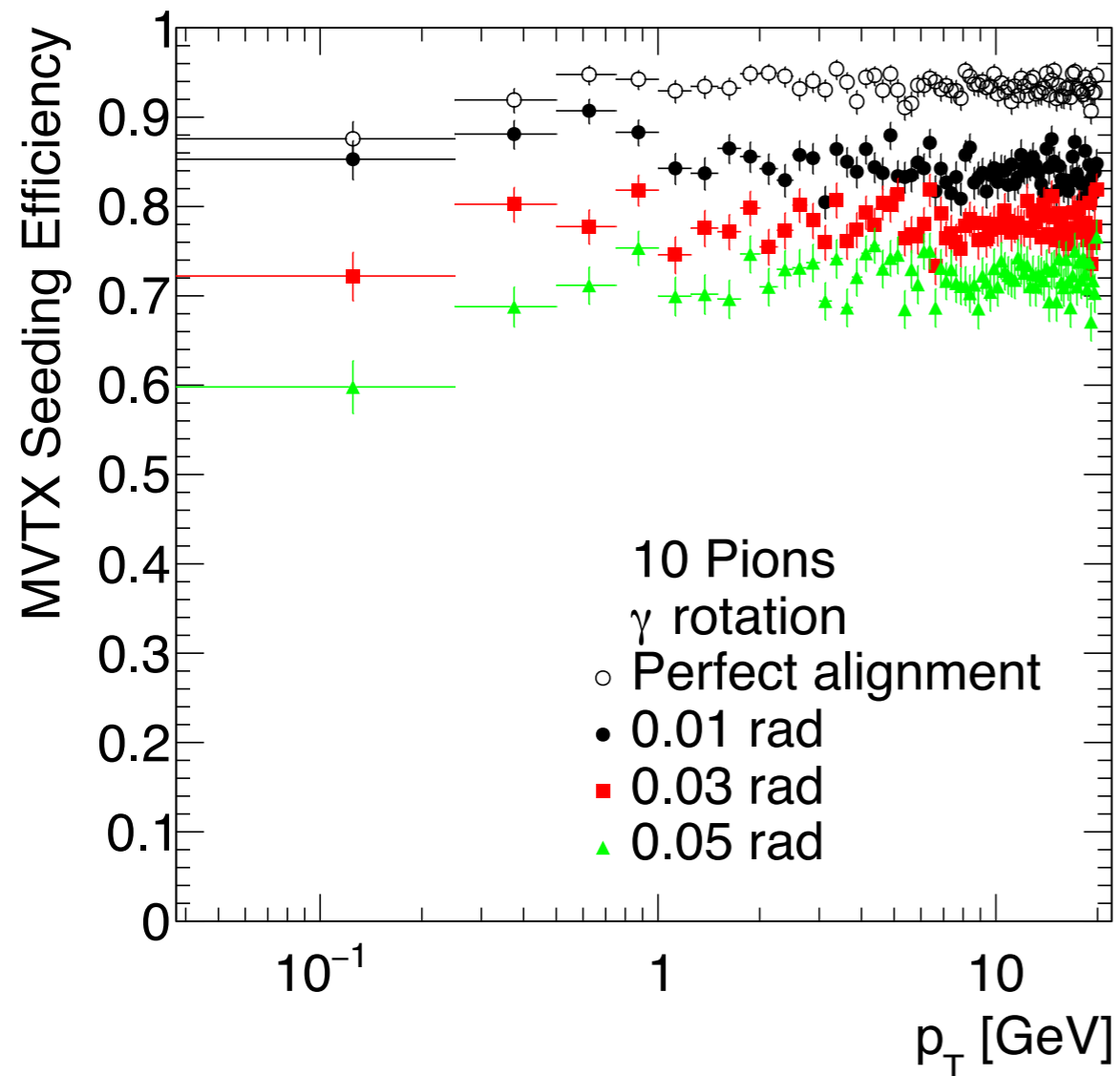
- Similar conclusions to Reese's study
- The misalignment has an effect already at the 0.01 rad level
- Reese's efficiency is worse by $\sim 30\%$, so we lose another 30% of tracks from fitting/matching etc

MVTX Seeding Efficiency



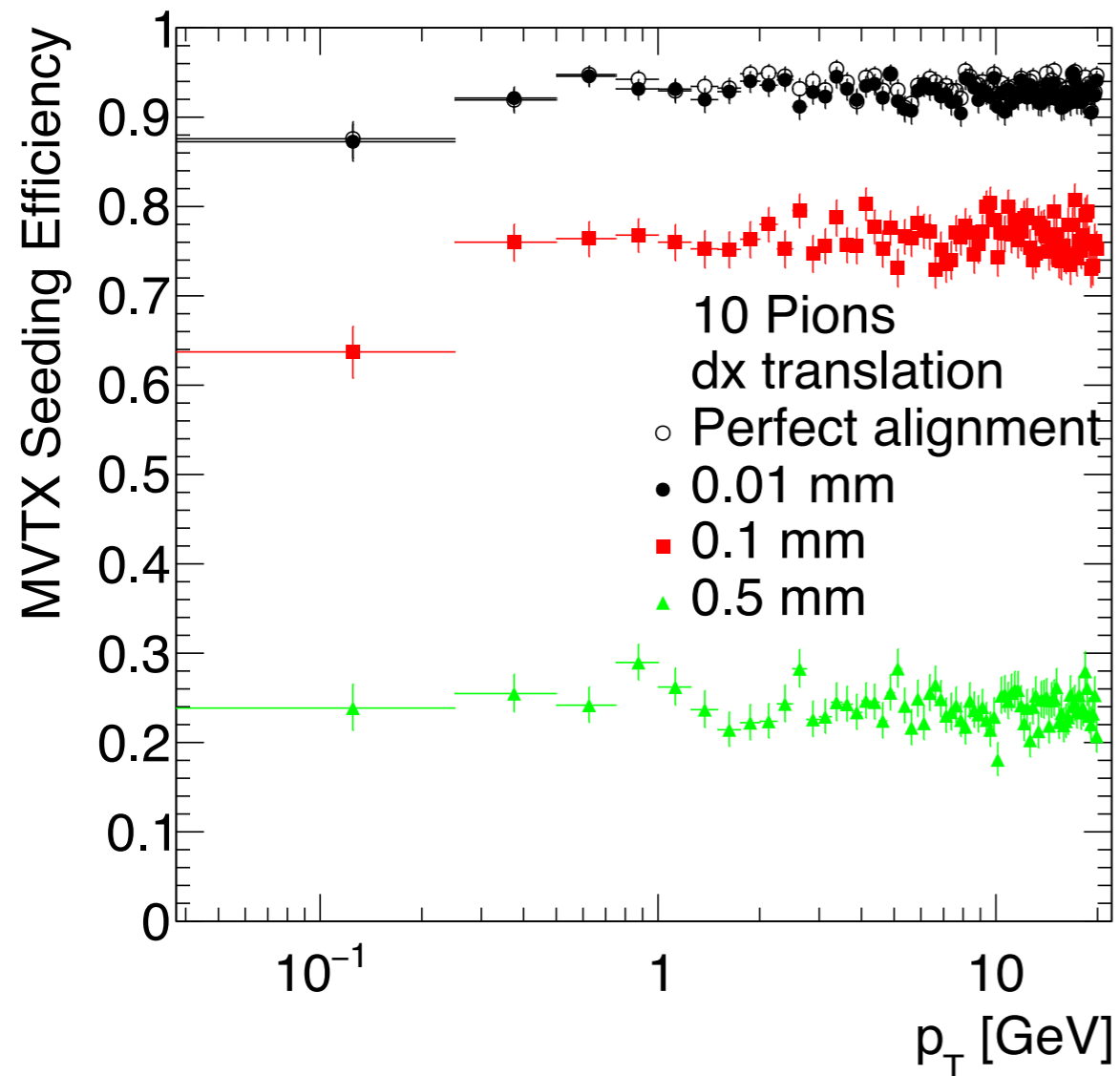
- Similar conclusion to Reese's study - most sensitive to beta rotation
- Lose another $\sim 50\%$ of tracks from matching/fitting

MVTX Seeding Efficiency



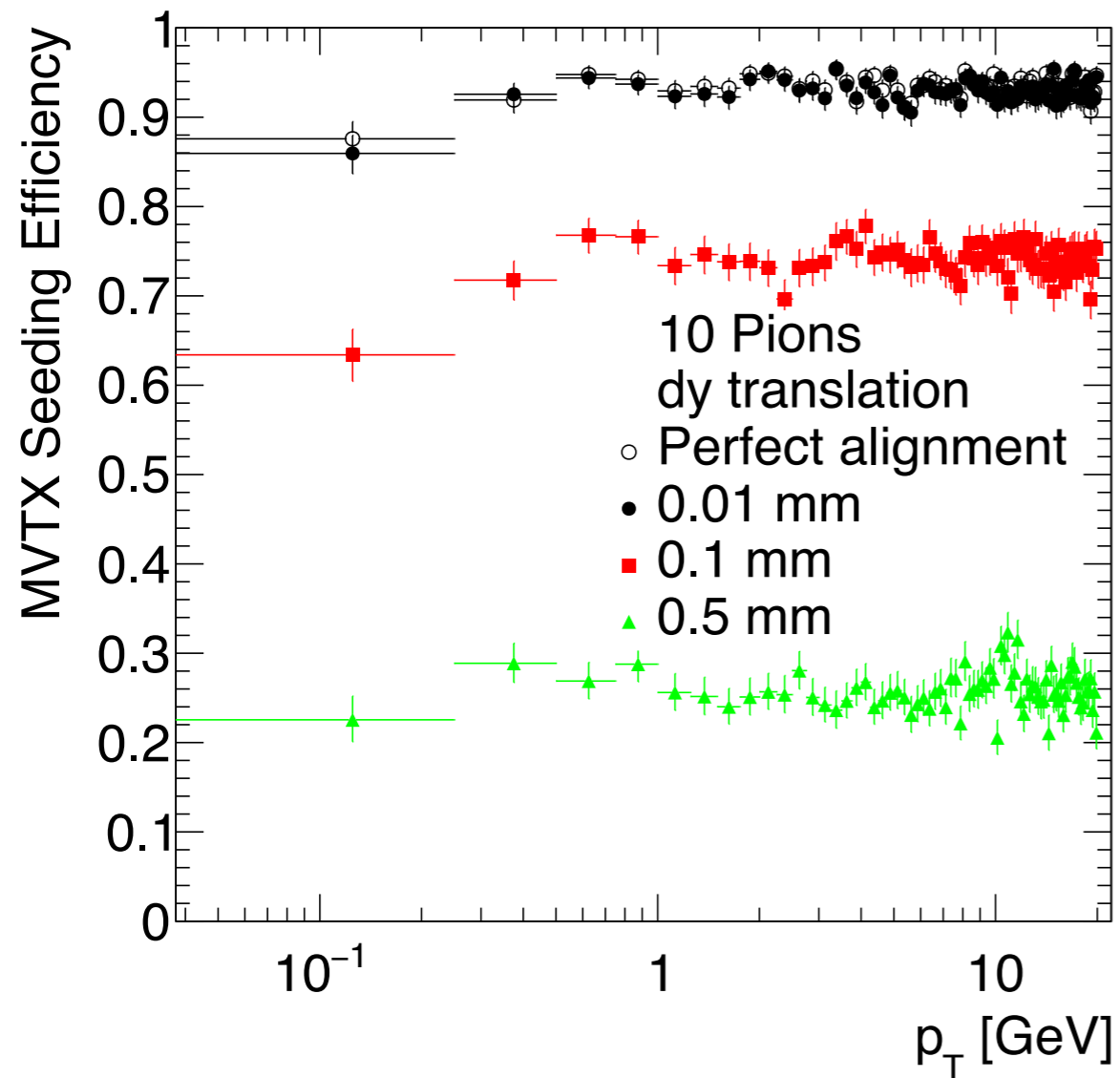
- Not so sensitive to rotation around the z axis
- Lose another ~20% of tracks from fitting/matching

MVTX Seeding Efficiency



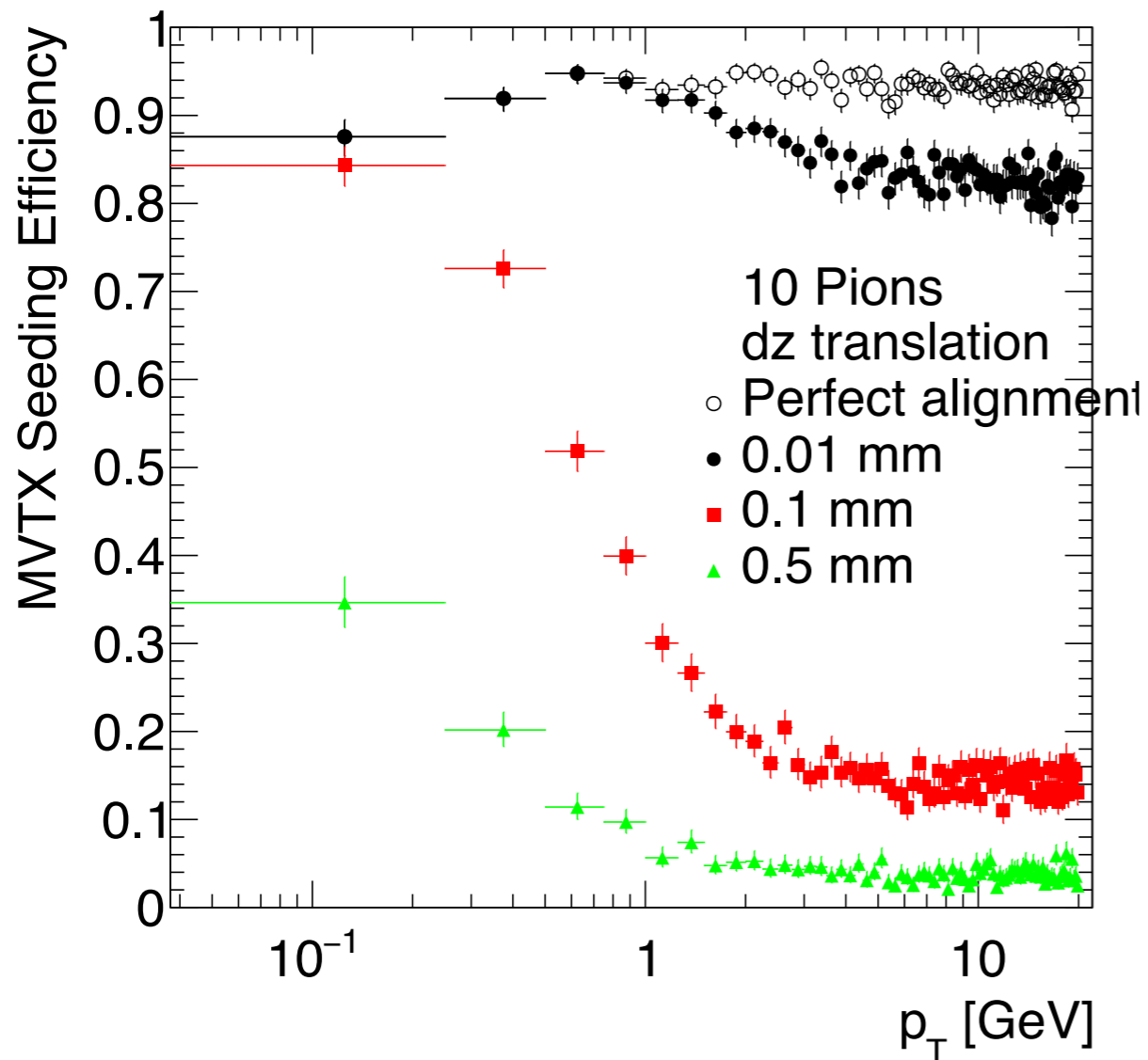
- Quickly lose seeds past 100 micron misalignment
- Lose another $\sim 50\%$ of tracks from fitting/matching
- Suspect a lot of this loss is from PCA match - probably improved by restricting only to eta match

MVTX Seeding Efficiency



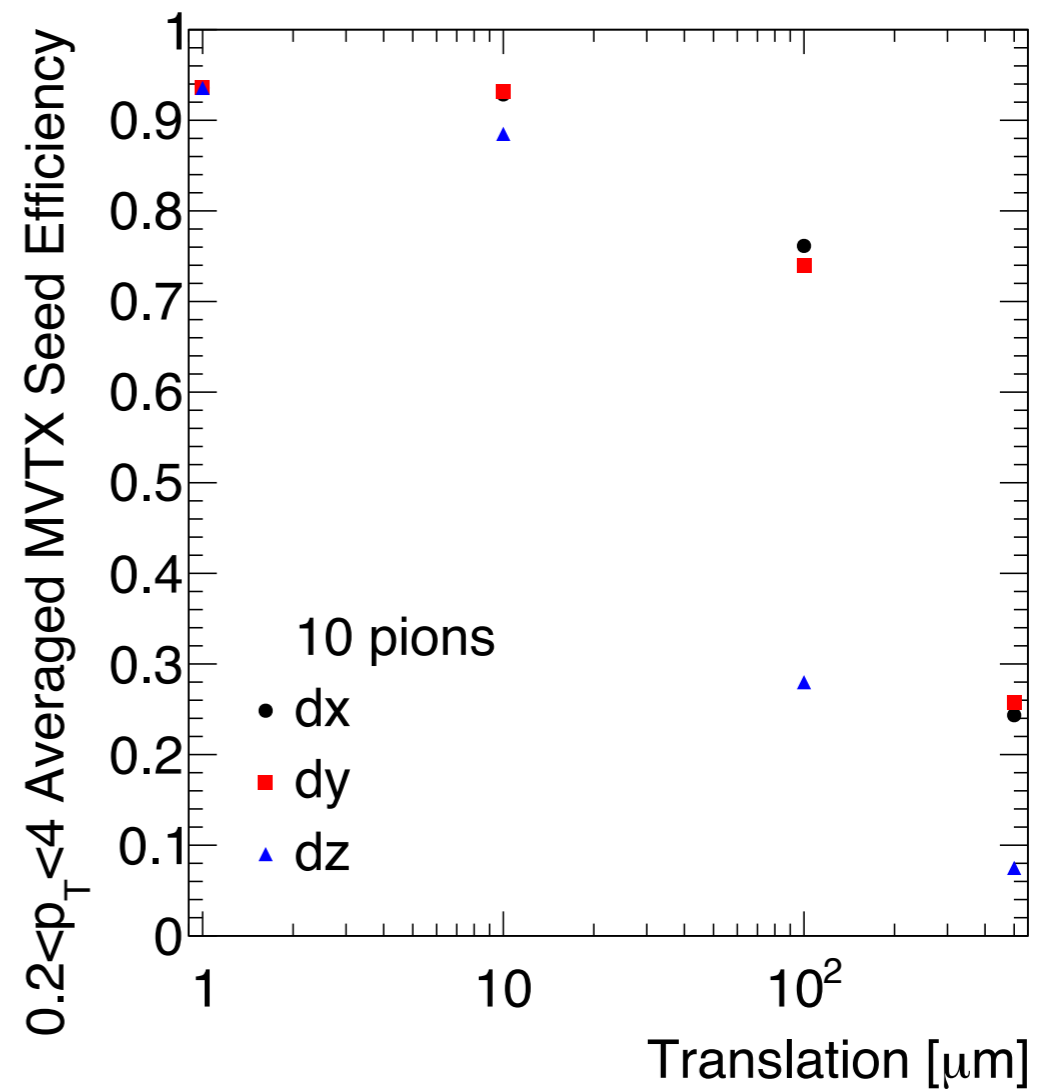
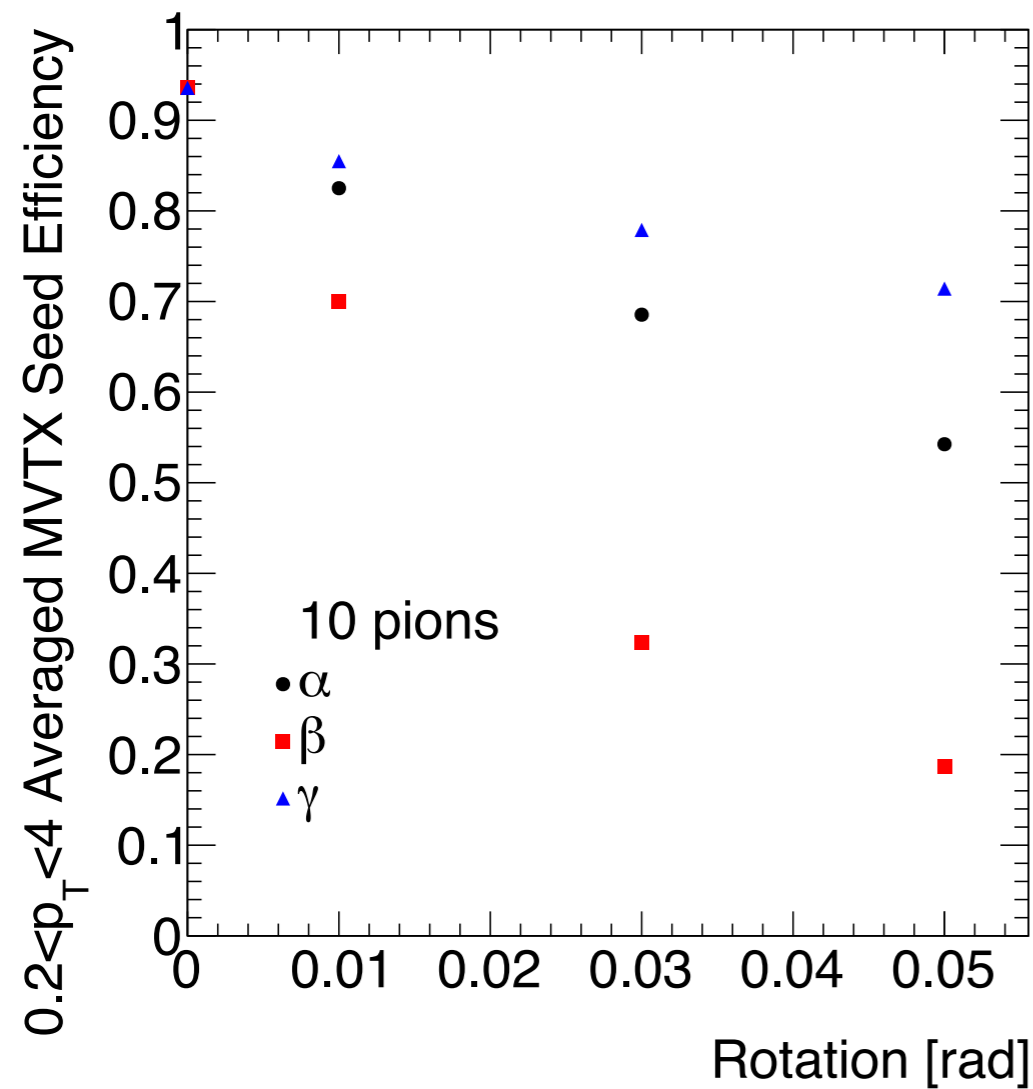
- dy translation very similar to dx

MVTX Seeding Efficiency



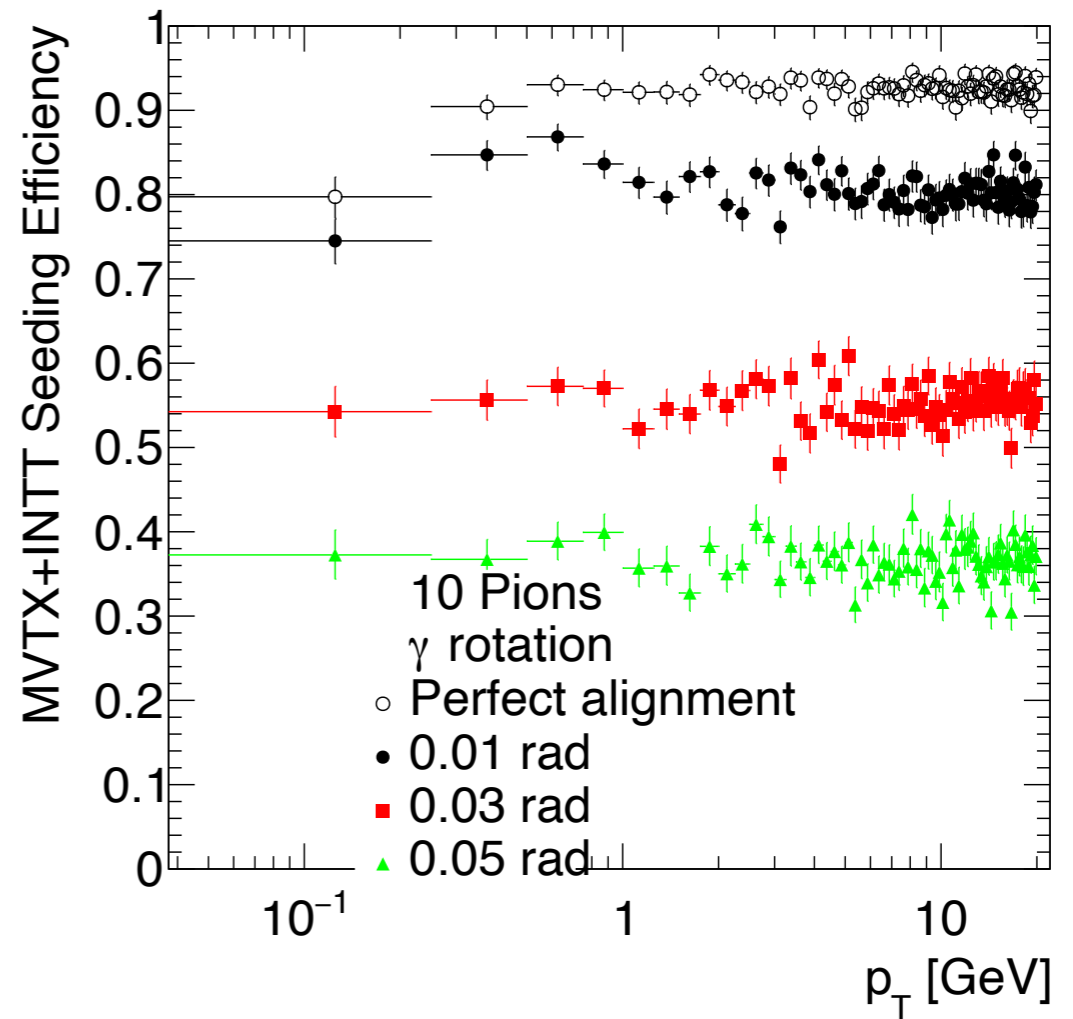
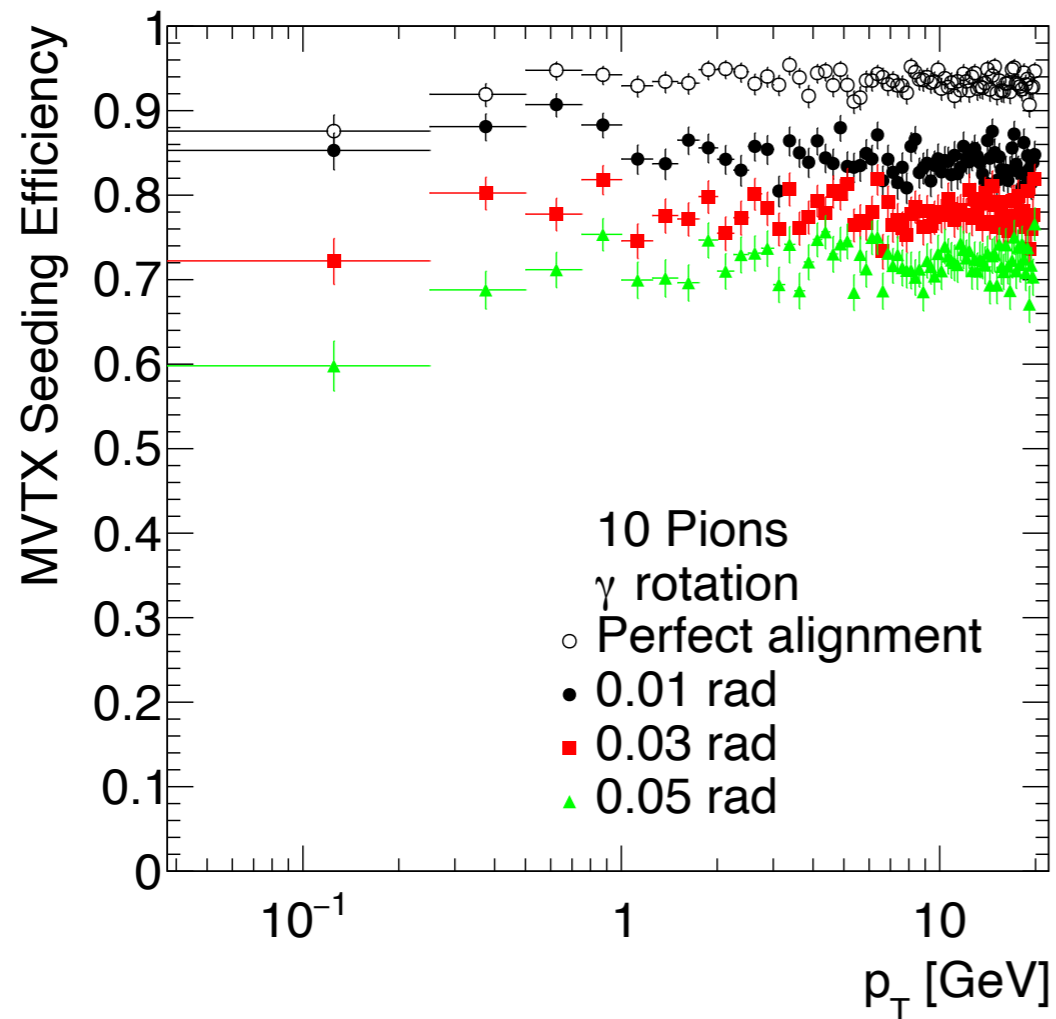
- dz translation efficiency is strongly dependent on p_T
- Can't even tolerate 100 micron misalignment in z without changing cluster uncertainties

Summary plots



- Fit $0.2 < p_T < 4$ GeV to a pol0 to get a crude estimate of seeding efficiency integrated over p_T

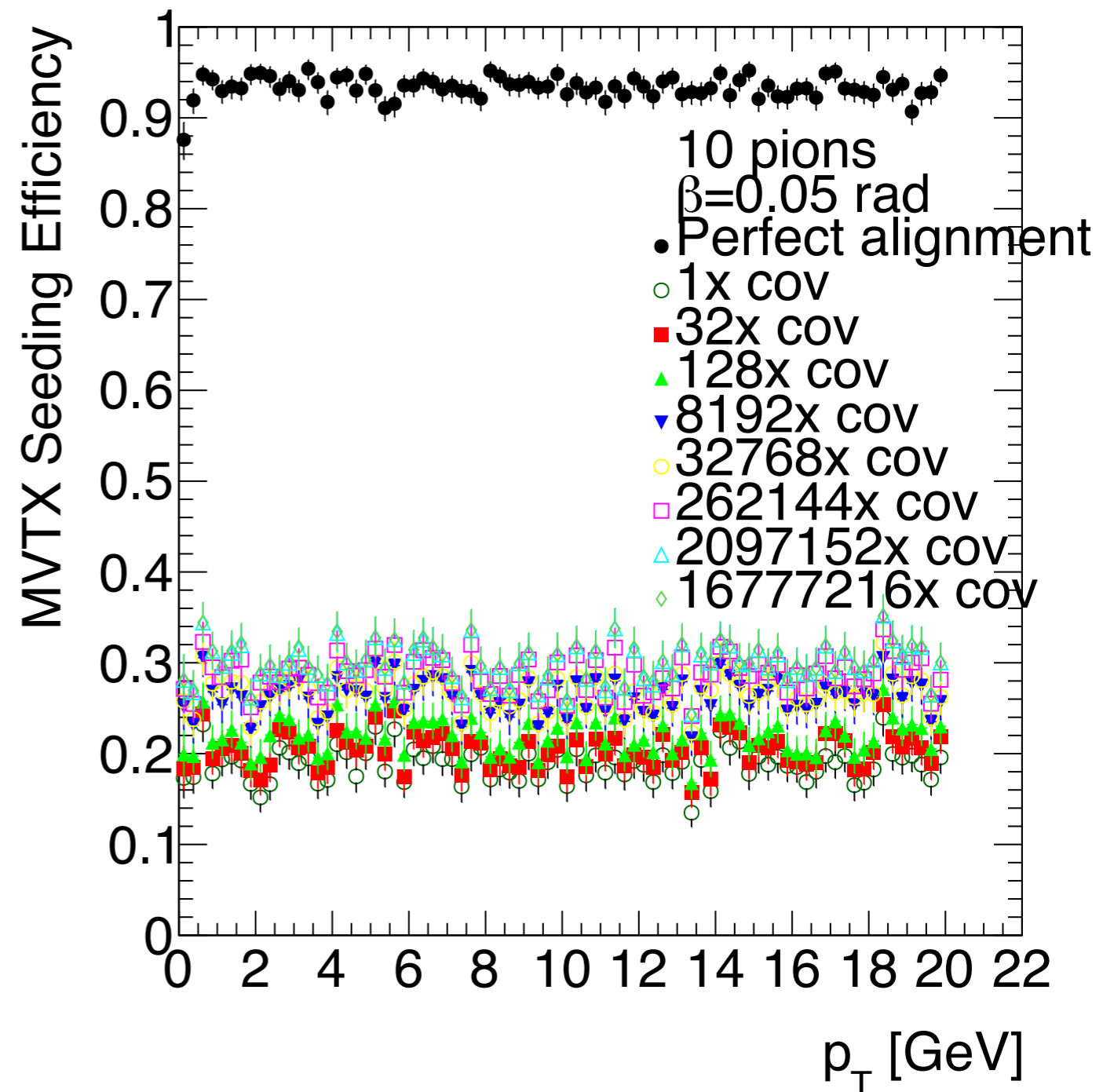
INTT Projections



- Made similar plots with a perfectly aligned INTT to test projectivity lever arm
- Even the least sensitive perturbations have a significant effect when the MVTX is misaligned to the INTT
- All plots in backups

Seeding with Large Covariances

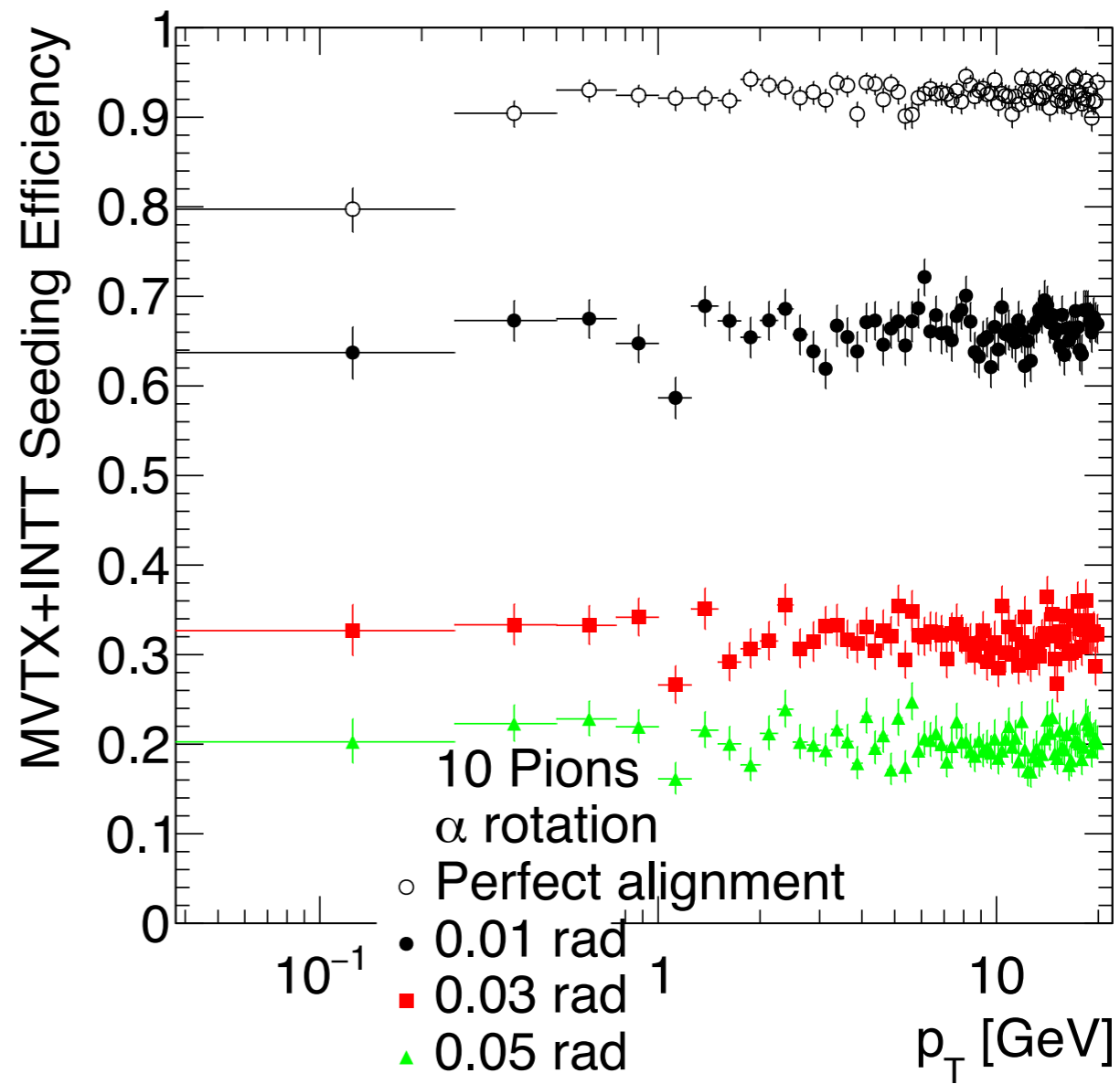
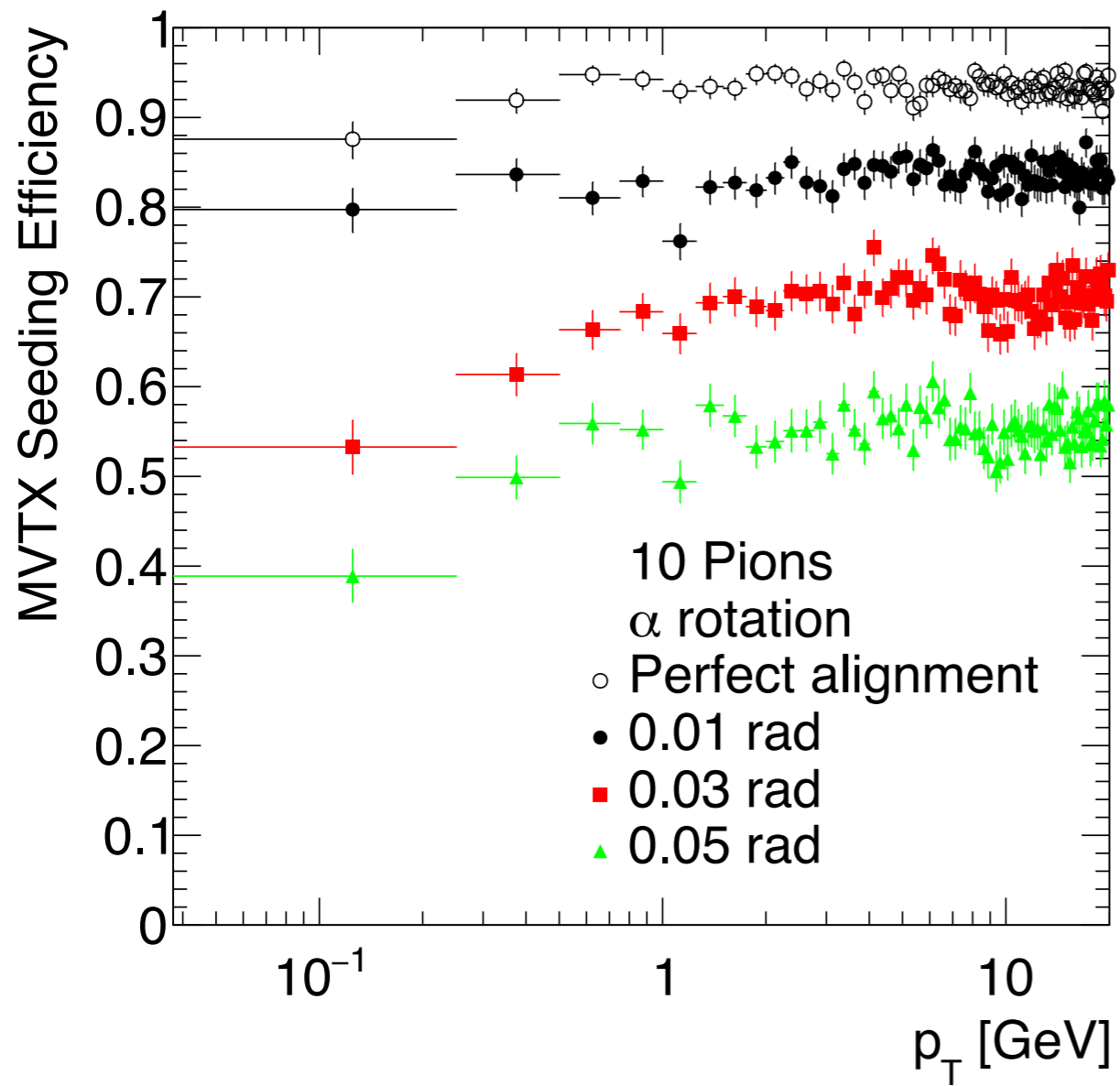
- Can we recover the lost MVTX seeds with blown up covariances?
- The most sensitive perturbations seem to be very averse to recovering seeding performance...
- This plot is not encouraging

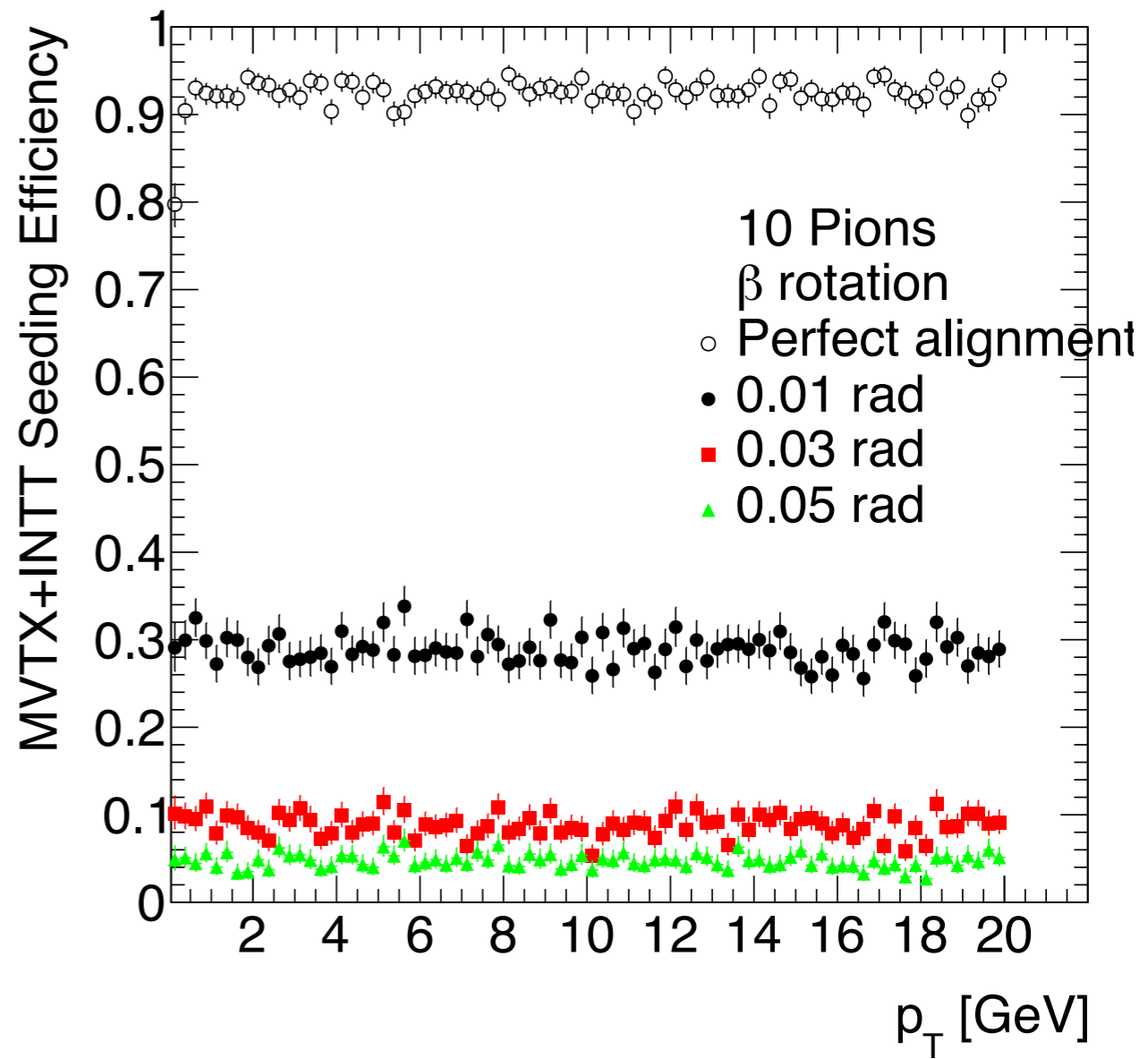
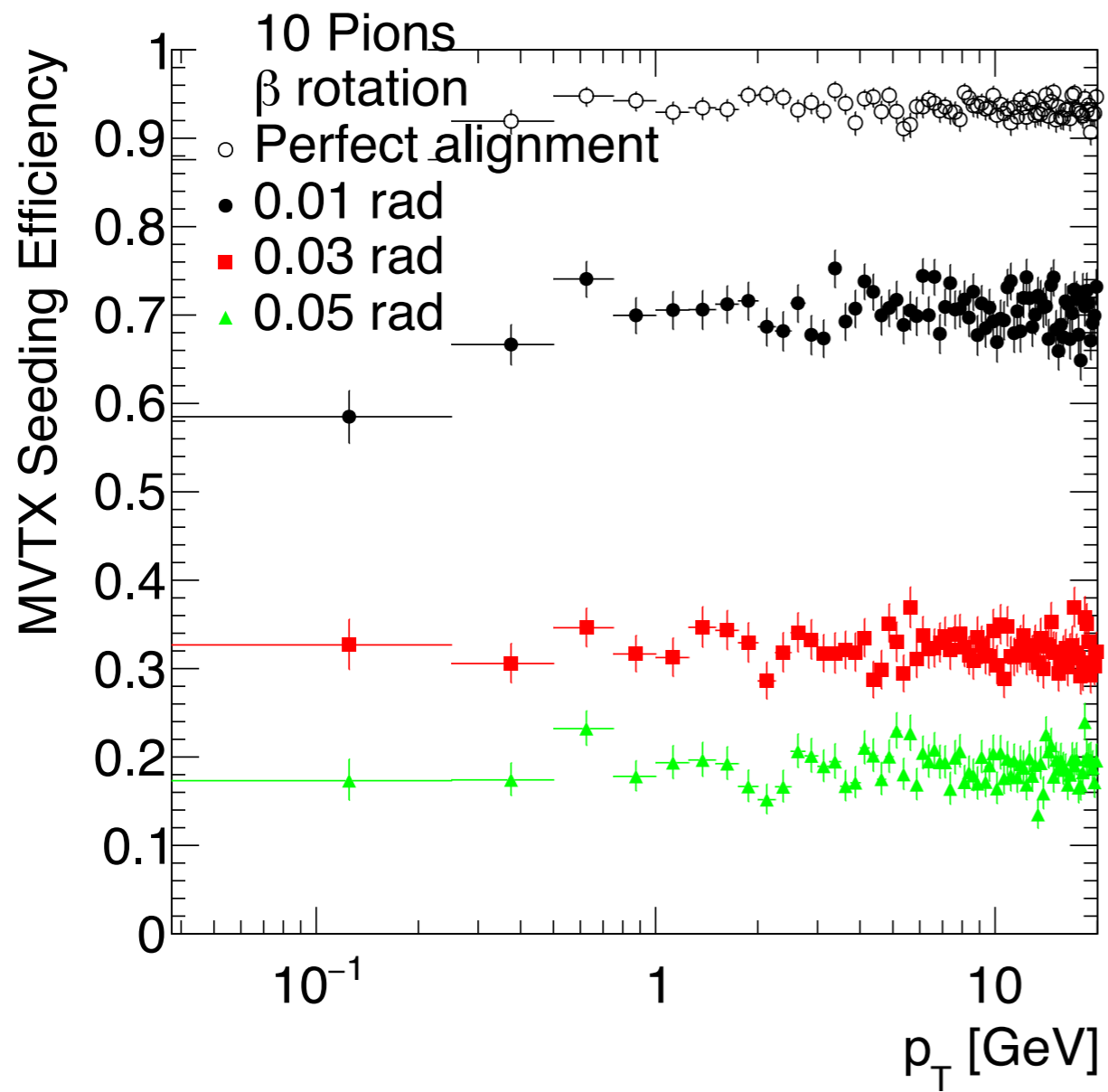


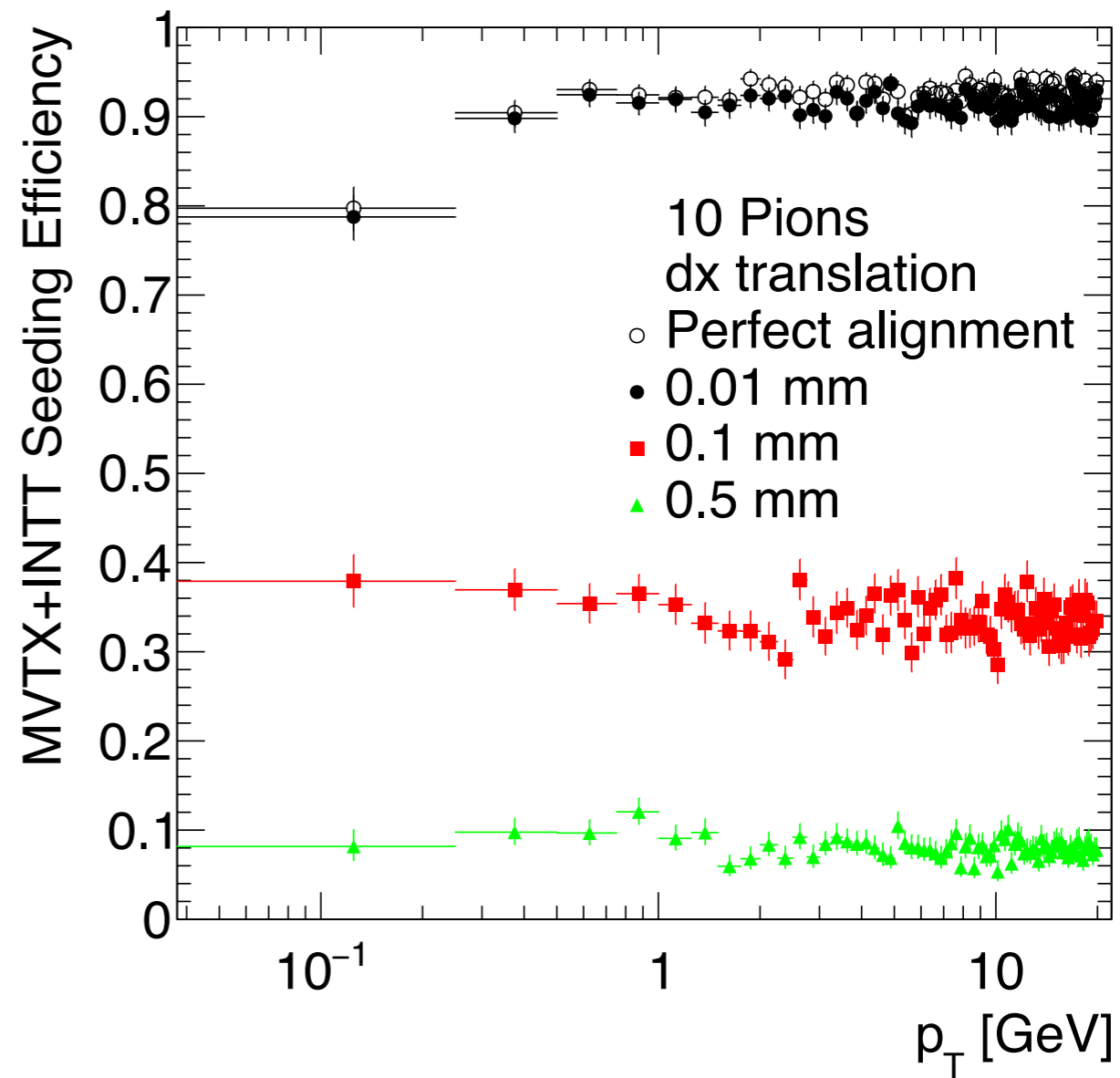
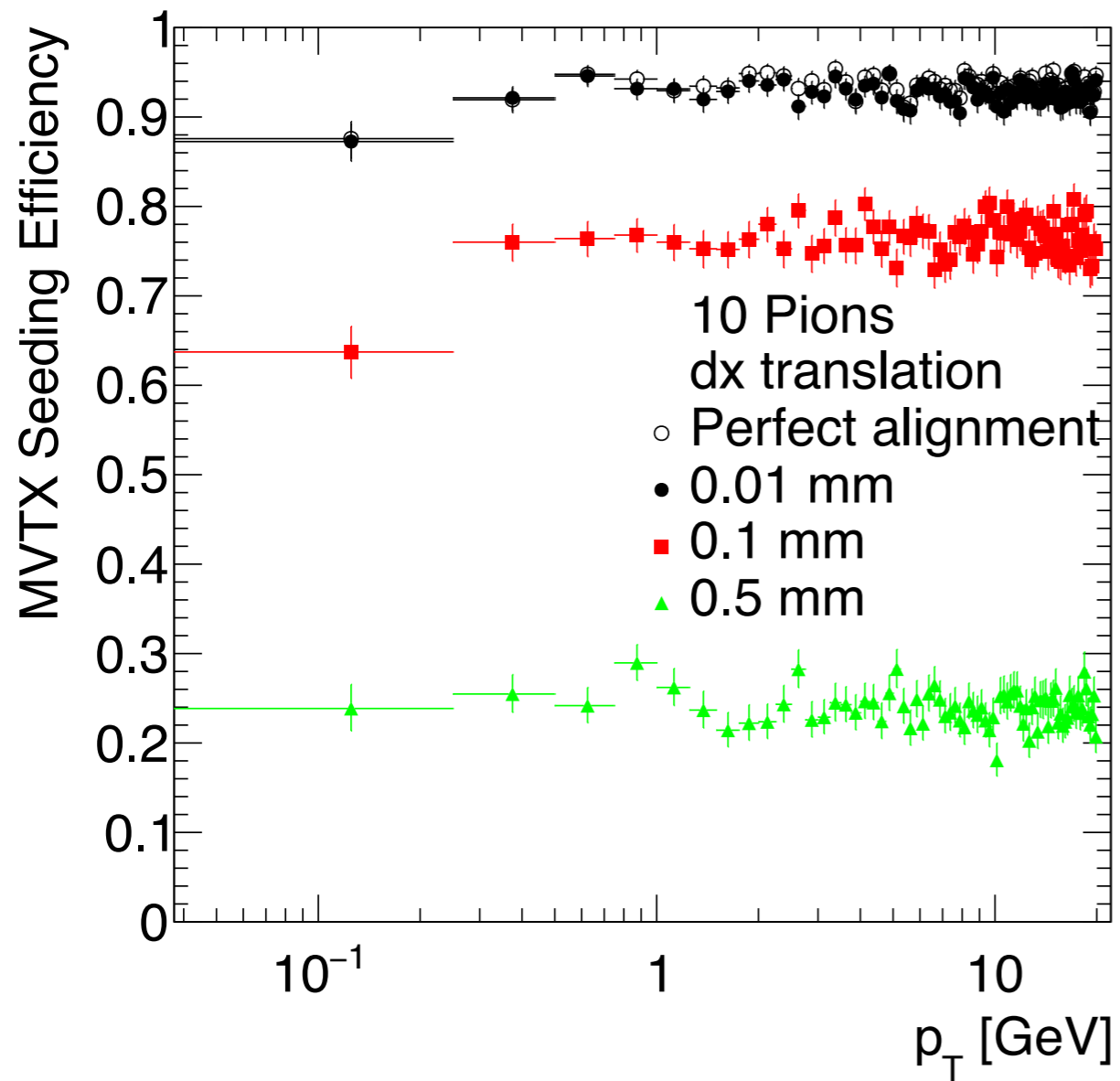
Conclusions

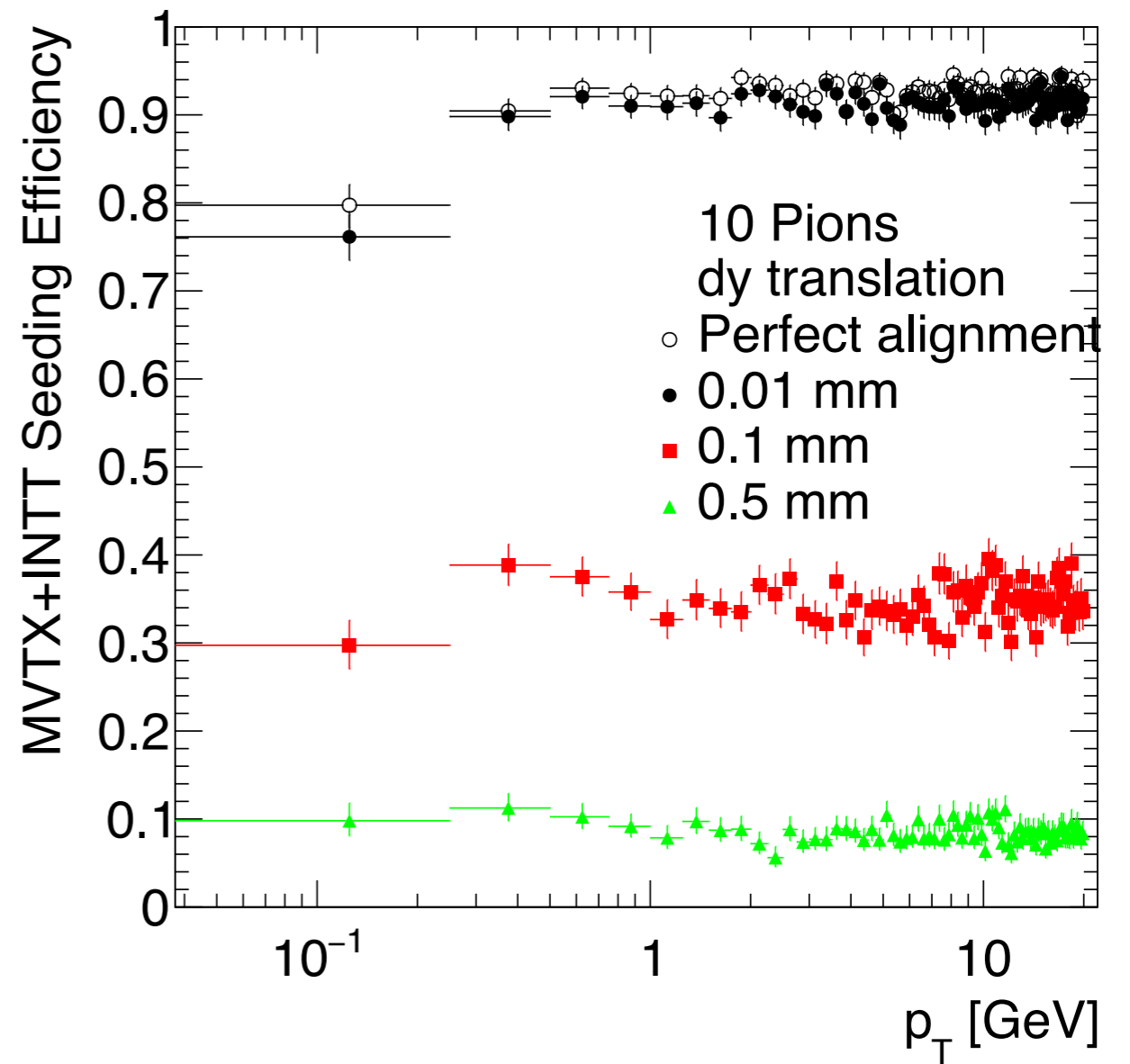
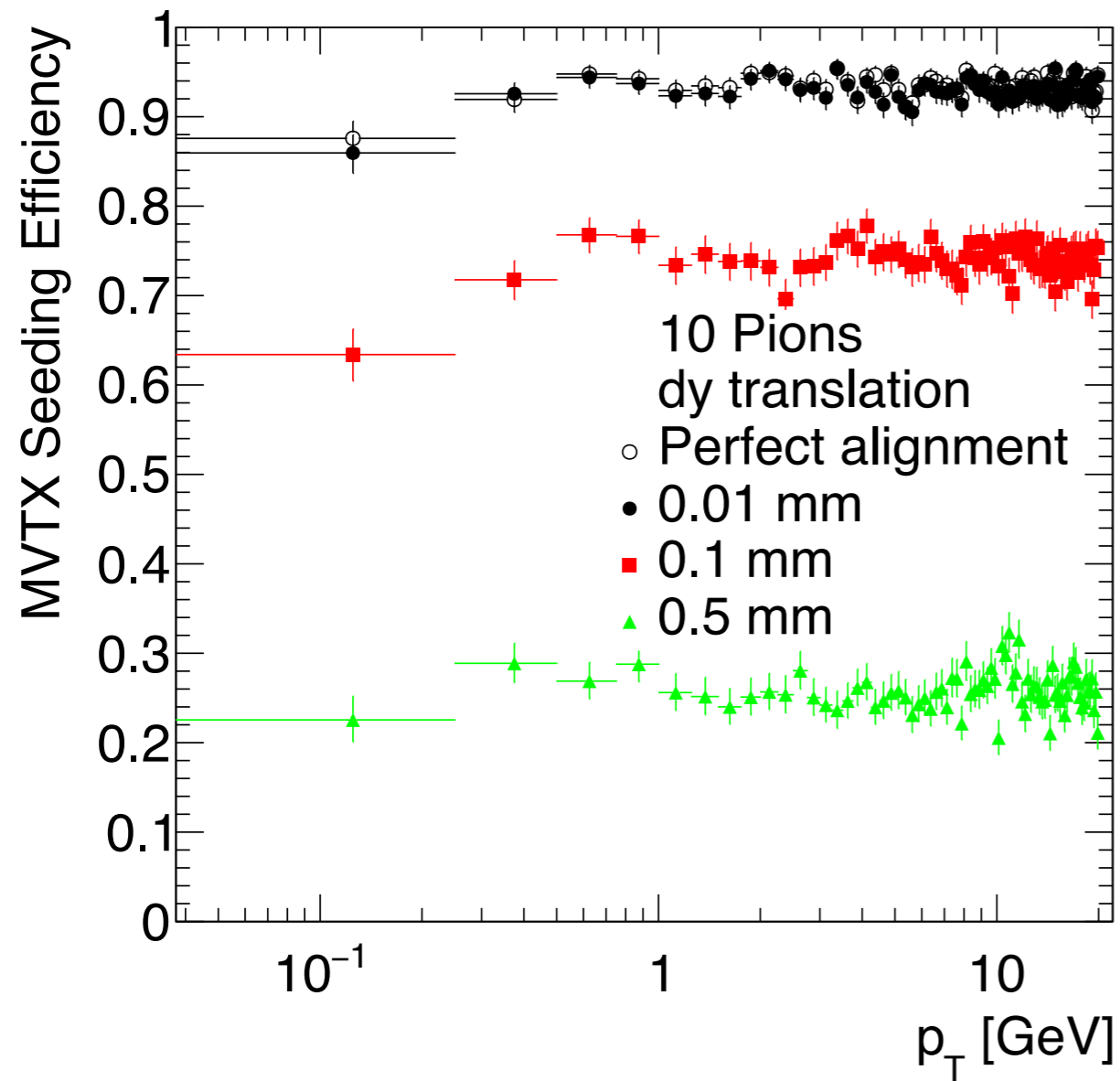
- Reese's initial study showed complete track reconstruction sensitivity to misalignment
- This shows the sensitivity is already strong at the seeding level
- Need to discuss seeding strategy with Andi at the meeting on Tuesday, given that the Acts seeder is a repurposed Atlas seeder
- How did they overcome this at LHC?

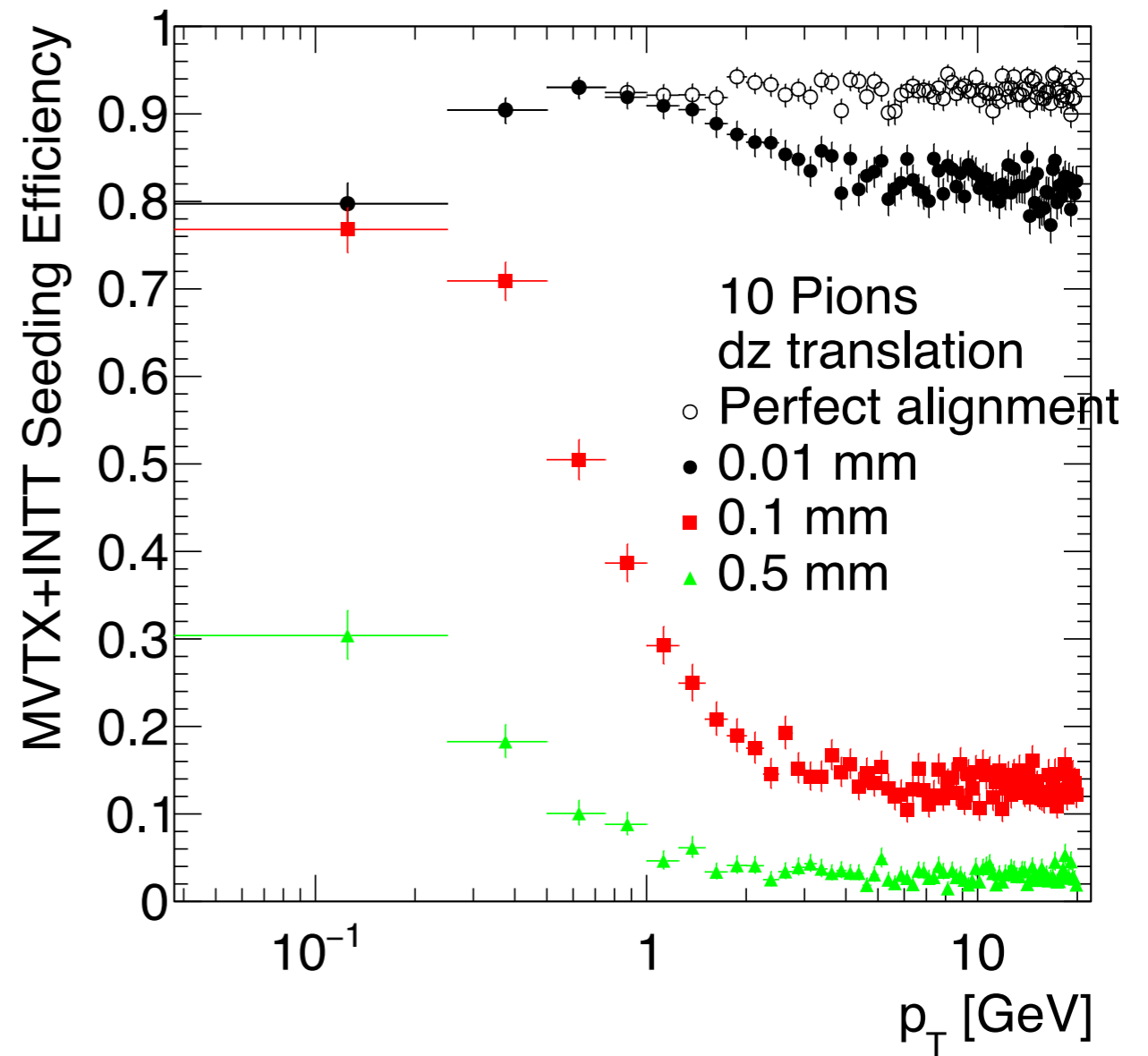
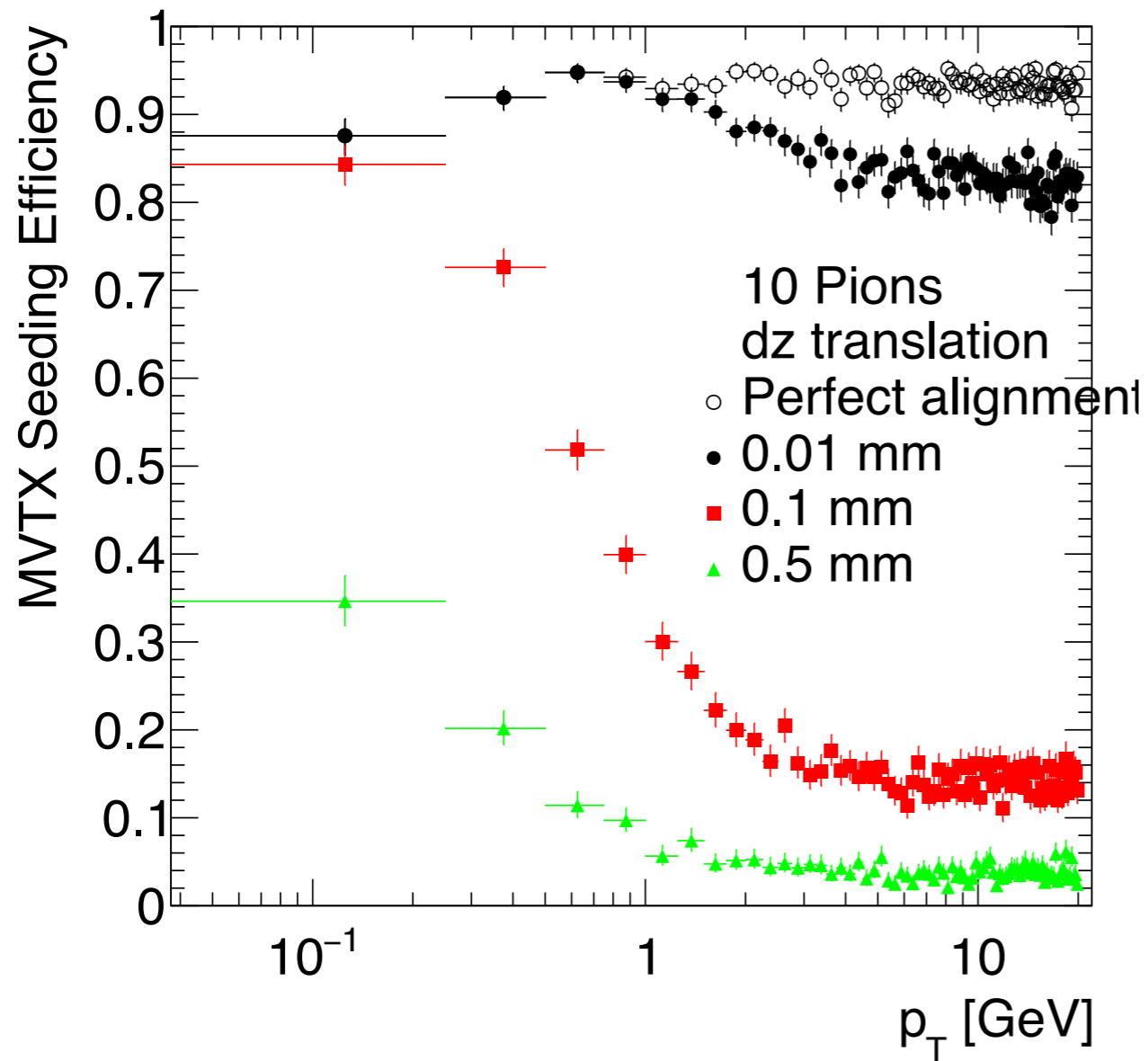
Extras











- dz is naturally least sensitive because of strip length of INTT