

### Performance of the IST in the normal and rotated configurations:

The orientation of the IST layers is important. Consider the canonical configuration where both IST layers have their best resolution in the R-Phi direction. The efficiency of finding tracks on the HFT using only the IST1+IST2 layers is relatively low and is shown as the black line in figure 1. For this configuration, the efficiency for finding a kaon at 750 MeV is about 55%. Note that this is the single track finding efficiency in the HFT. If you want to find a D0 meson, then you should multiply this percentage by the efficiency of finding a pion at somewhat lower pt. Thus, the efficiency for finding a D0 with this configuration is about 25%; and much worse for a lambda-C. There are other inefficiencies and cuts ... so this is an upper estimate.

However, if I rotate the IST2 layer by 90 degrees, then the efficiency of the tracking system improves to about 85% for the Kaon. This is shown in Blue on the figure. The overall efficiency for finding a hypothetical D0 should increase to about 60%

Thus I recommend rotating IST2 by 90 degrees. It is worth the pain.

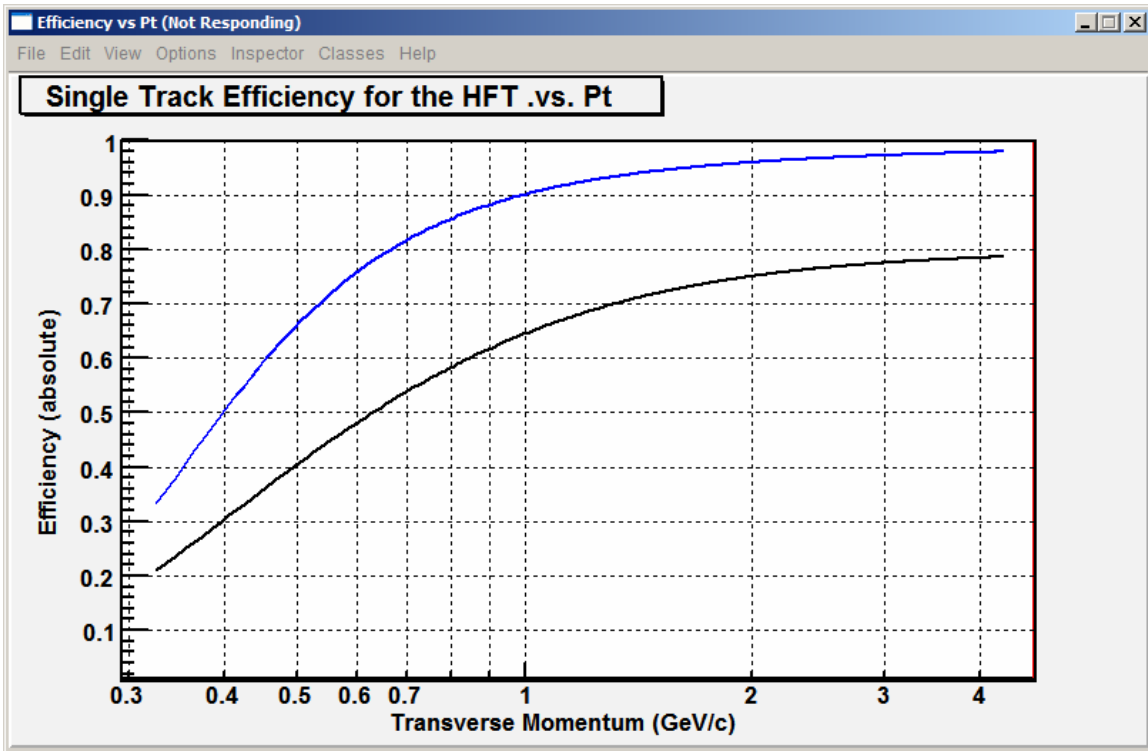


Figure One: The efficiency (1-ProbGhostHit) for a single track in the HFT vs. Pt. Two cases are compared. The detector configuration assumes only the IST, or in other words HFT1+HFT2+IST1+IST2+SSD+TPC. The black line shows IST2 in the normal configuration. The Blue line shows IST2 rotate by 90 degrees.

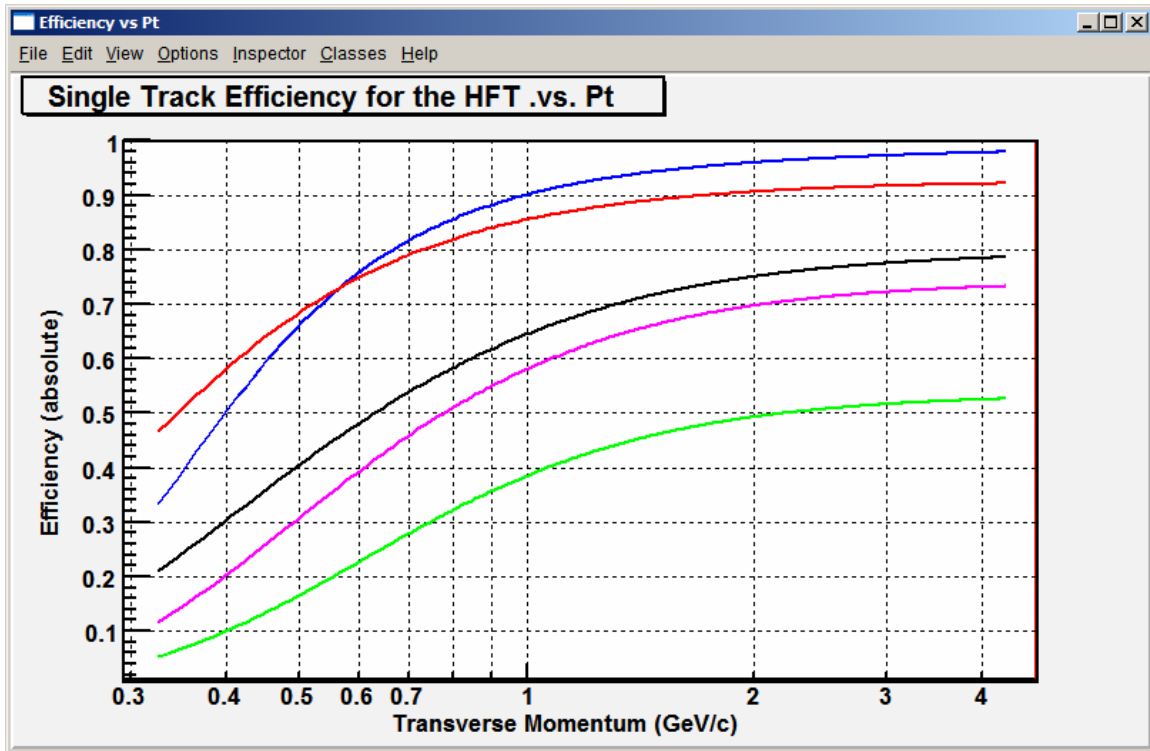


Figure Two: Comparison of various detector configurations

The green line in figure 2 shows you the efficiency for finding a single track in the HFT if the TPC is the only tracking detector (with no scattering material in between it and the HFT). The efficiency for finding a D0 would be extremely low in this configuration. The purple line demonstrates that the addition of the SSD improves the resolution of the track finding system, however, its poor resolution in Z really affects the ability of the system to find tracks on the outer surface of the HFT. The black and blue lines are the same as in figure one. The black line is for IST2 in the normal configuration and the blue line is for the IST2 in the rotated configuration. The red line is the efficiency of the HPD and the SSD working together (no IST layers, and no scattering from these layers). Because the HPD has a fixed orientation with respect to R-Phi and Z, it does not do as well as the rotated IST layers even though it is closer to the HFT.

Once again, I conclude that **HFT1+HFT2+HPD+SSD+TPC** performs about as well as **HFT1+HFT2+IST1+IST2+SSD+TPC**. The two tracking systems are equivalent. However, I must rotate IST2 by 90 degrees to achieve this result. Otherwise, the IST acting alone is not the best tracking and pointing system for the HFT.