Shane Sweetman

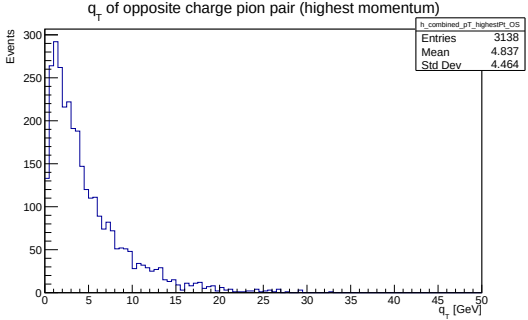
Project update meeting
Week 6

A TMD-oriented analysis of $\pi^+\pi^-$ pairs in e^+e^- collisions

Recap: beam-axis vs thrust-axis

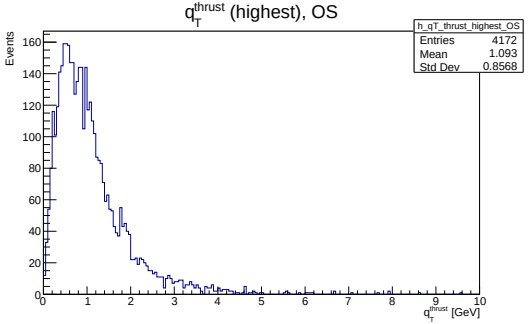
Before (beam axis) — Week 2

Highest-p_T OS using beam-axis q_T.



After (thrust axis) — Week 4

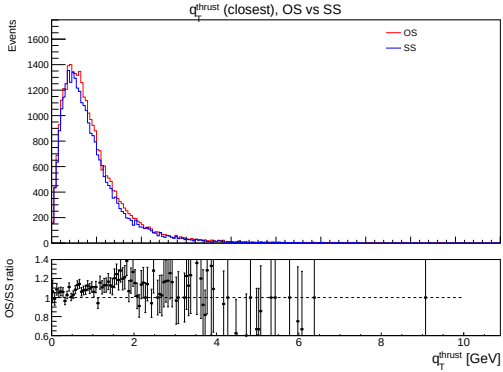
Highest-p_T OS using q_T^{thrust} (zoomed to small-q_T).



Recap: overlays + OS/SS ratio panel

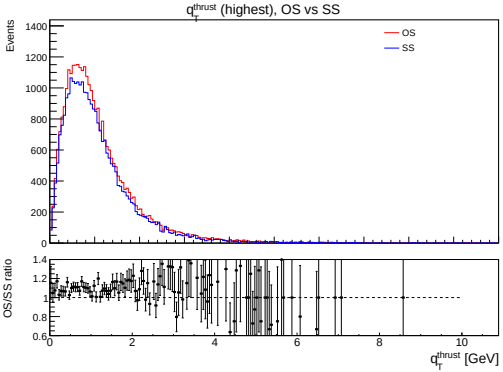
Closest strategy

Overlay + OS/SS ratio vs q_T^{thrust}.

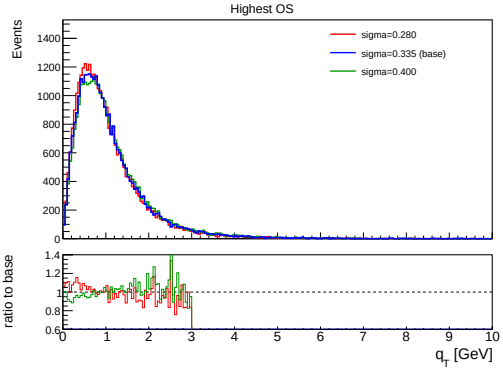


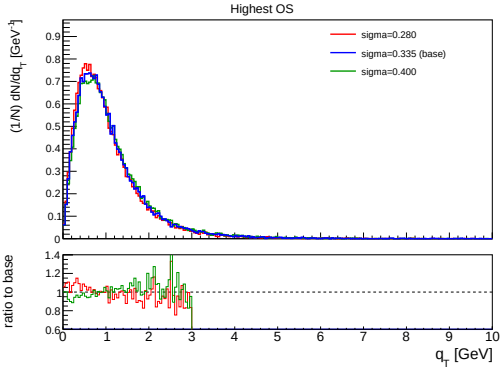
Highest-p_T strategy

Overlay + OS/SS ratio vs q_T^{thrust}.



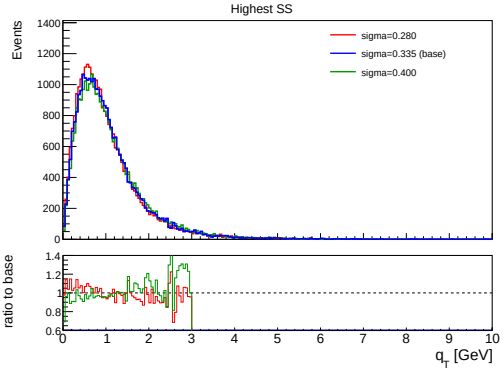
Scan 1 recap: `StringPT:sigma` (OS panels)

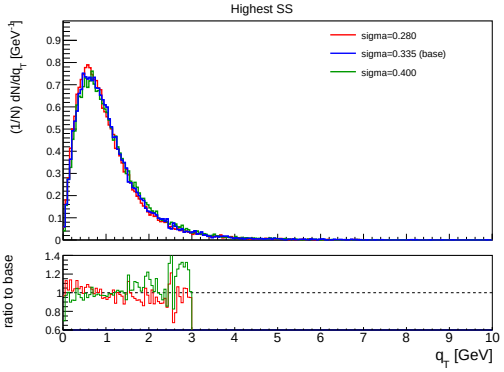




Left: OS comparison in **raw counts**. Right: the same OS comparison after **shape normalisation**. The reference curve is `sigma = 0.280`, and `sigma` is a transverse-momentum width, so its natural Pythia units are **GeV**. [4]

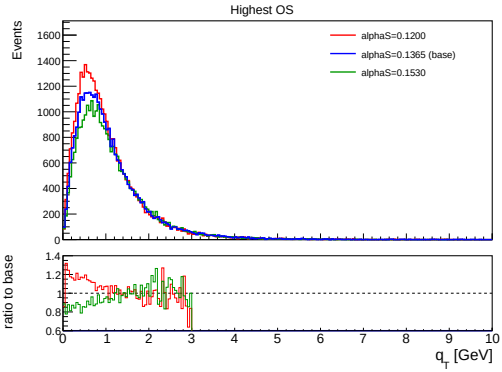
Scan 1 recap: `StringPT:sigma` (SS panels)

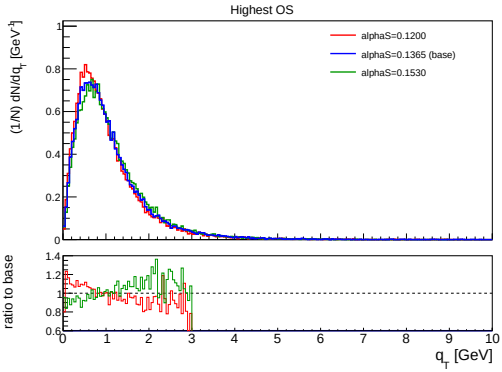




SS gives the matched reference channel for the same `StringPT:sigma` variation. [4]

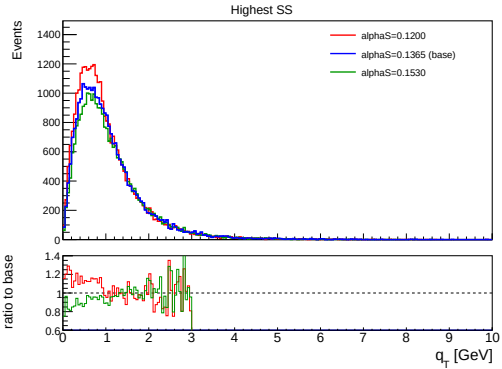
Scan 2: shower α_s (OS panels)

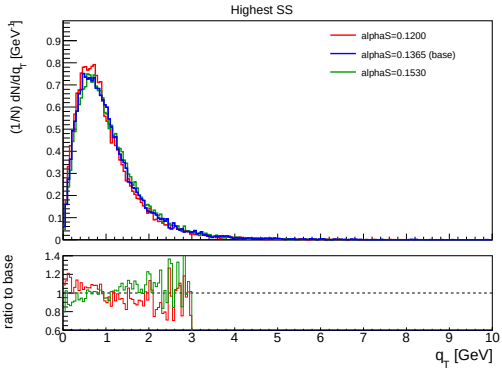




OS channel: left is raw yield, right is the shape-only response to the shower scan. [2]

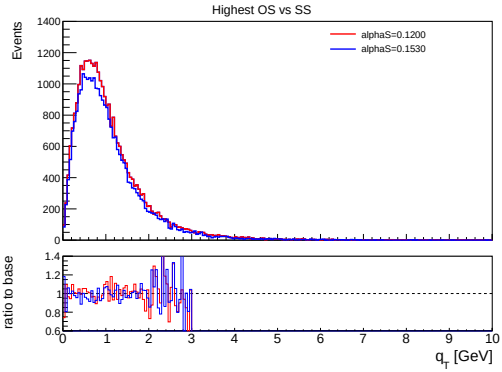
Scan 2: shower α_s (SS panels)

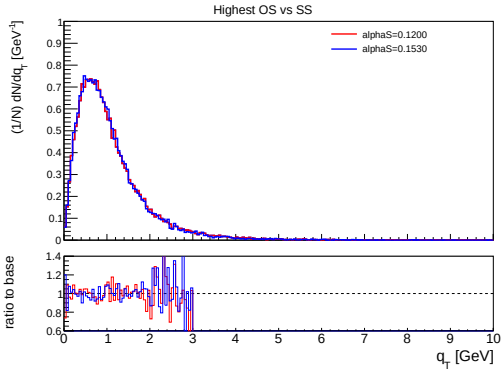




SS channel: the matched comparison for the same shower-α_s scan. [2]

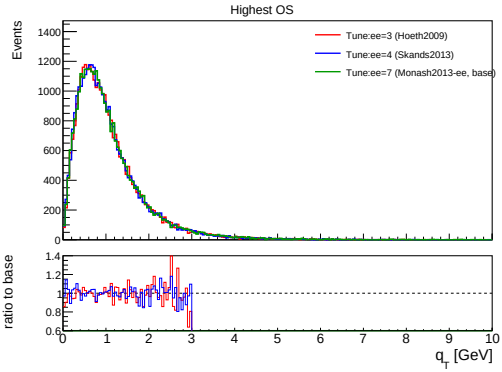
Scan 2: shower α_s comparison

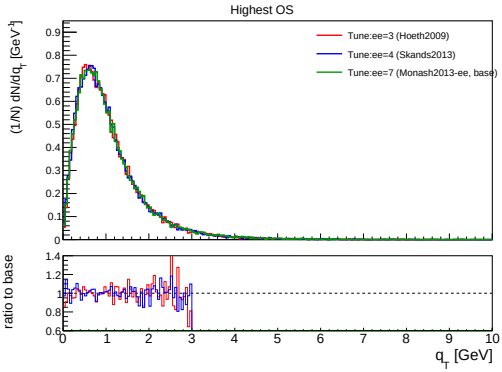




Varying the final-state shower strength changes radiation and recoil. Counts and shape should be read separately. [2]

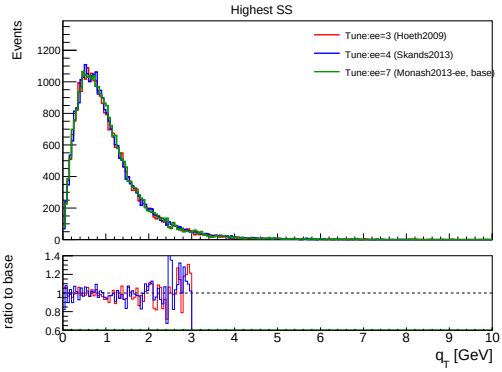
Scan 3: global tunes (OS panels)

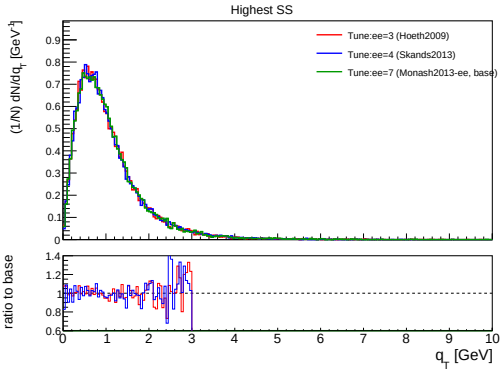




OS response under full tune changes. The shape panel is the cleaner comparison. [1,3]

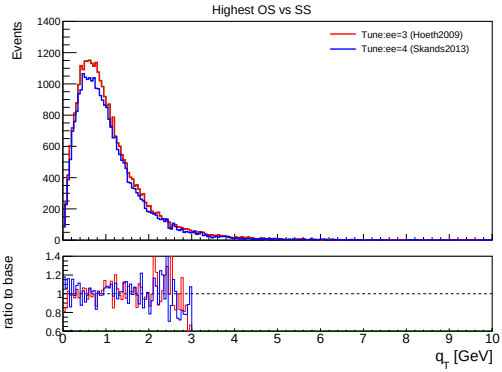
Scan 3: global tunes (SS panels)

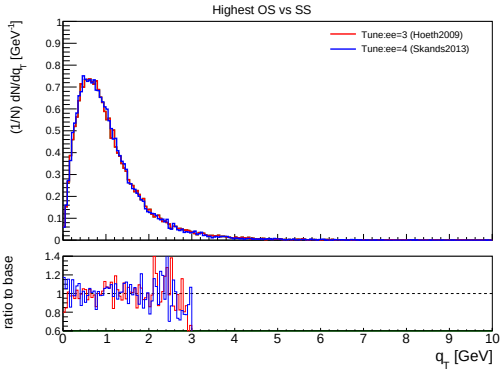




SS provides the matched comparison for the same tune variations. [1,3]

Scan 3: global tunes comparison





Global tunes vary correlated parameter sets together, so this is a stronger stress test than a single-knob scan. [1,3]

Questions?

References

[1] PYTHIA 8 Online Manual, *Tunes*: `https://pythia.org/latest-manual/Tunes.html`

[2] PYTHIA 8 Online Manual, *Timelike Showers*: `https://pythia.org/latest-manual/TimelikeShowers.html`

[3] P. Skands, S. Carrazza, J. Rojo, *Tuning PYTHIA 8.1: the Monash 2013 Tune*, `https://arxiv.org/pdf/1404.5630`

[4] PYTHIA 8 Online Manual, *PTSelection*: `https://pythia.org/latest-manual/PTSelection.html`