Key Differences wrt CMSSW

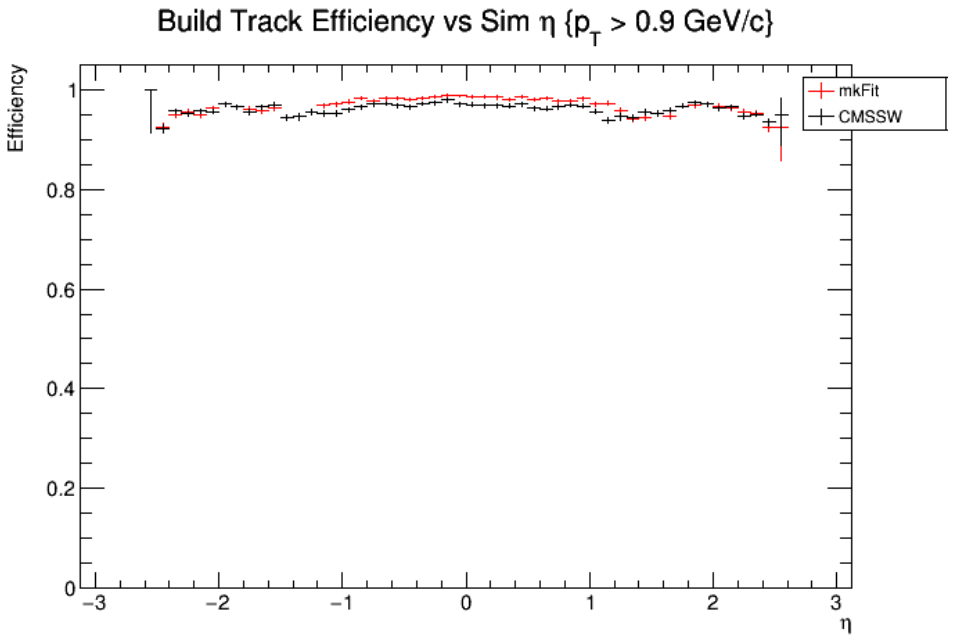
	CMSSW	MkFit
Seed Cleaning	Build tracks sequentially and remove hits that have already been assigned to a track	Everything is done in parallel. Apply seed cleaning before trying to build any tracks. After track building we can specifically try to remove duplicates (not done yet)
Hit Position	Reevaluate the hit position using the track direction	Hit position is taken from local reconstruction and not updated
Cluster Shape Cut	Remove spurious hits by checking if the shape of the cluster is consistent with the track direction	Not implemented
Geometry	Retains information about the detailed CMS geometry	Knows only about layers, not detector modules
Magnetic Field	Parameterized magnetic field	Currently using flat field. Will eventually use parameterized field
Mono/ Stereo Layers	Can pick up multiple hits while track building	MkFit can only pick up one hit. We could pick up overlap hits during backward fit. Not implemented yet.

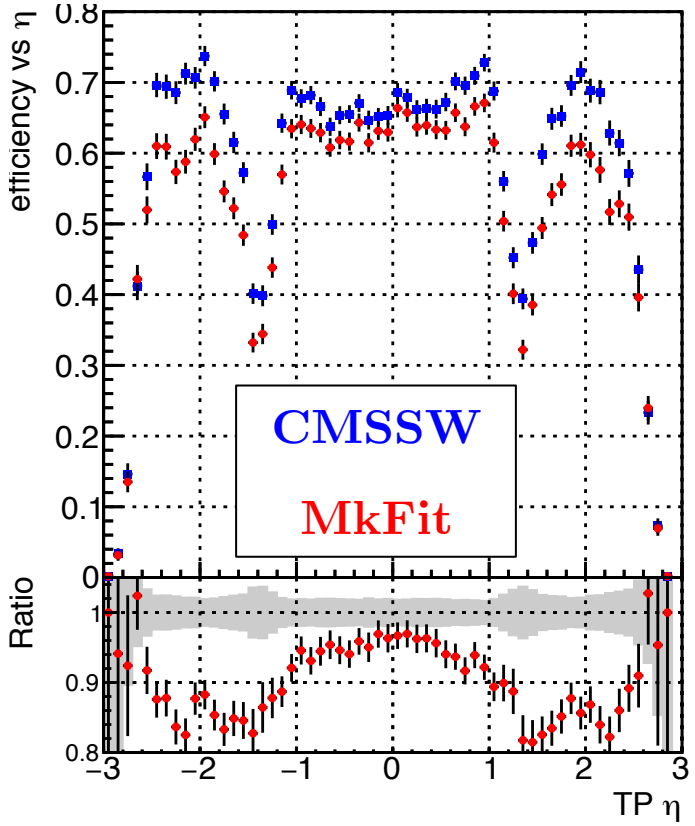
Validation Definitions

	Standalone validation	Multi-track Validation (MTV)
Reference tracks	• SIM or CMSSW "Findable" tracks with ≥ 12 layers (including 4 seed layers) • SIM tracks must be matched to a seed	SIM tracks satisfying • $p_T > 0.9$ GeV • $\|eta\| < 2.5$ • $\|dxy\| < 3.5$ cm
To-be-validated reconstructed tracks	• "Good" tracks with ≥ 10 hits • For mkFit tracks, 4 hits are required from the seed	Reconstructed tracks satisfying the same requirements as ref. tracks: • $p_T > 0.9$ GeV • $\|eta\| < 2.5$ • $\|dxy\| < 3.5$ cm
Matching criteria between ref. and reco. tracks	Considered matched if ≥ 50% of the hits are shared, excluding the seed	Considered matched if $> 75\%$ of the clusters of the reco track contain charge induced by the reference track

Efficiency vs eta

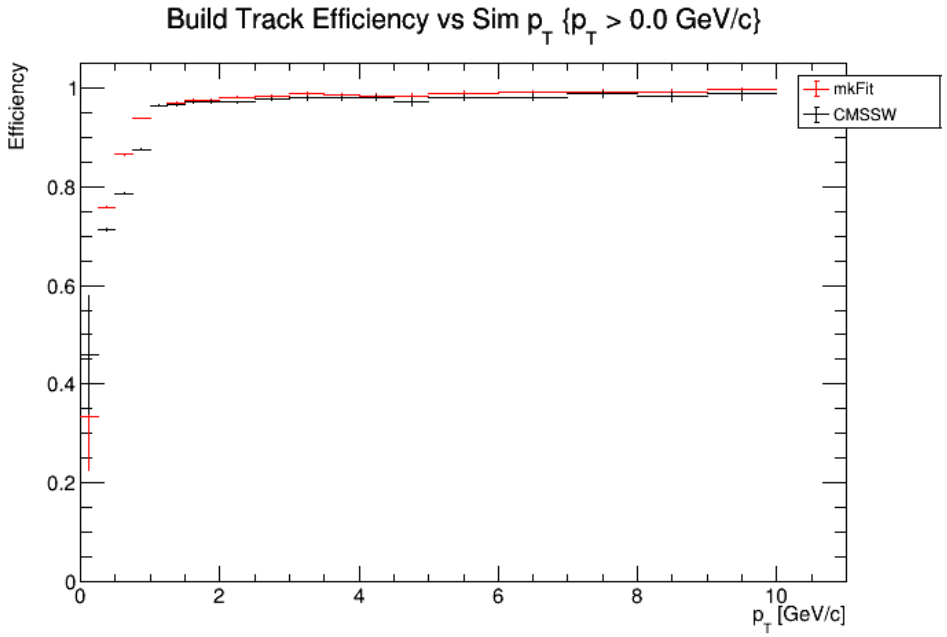
- Using TTbar PU 70 sample for standalone mkFit (left)
- Using TTbar PU 50 sample for mkFit as CMSSW external (right)

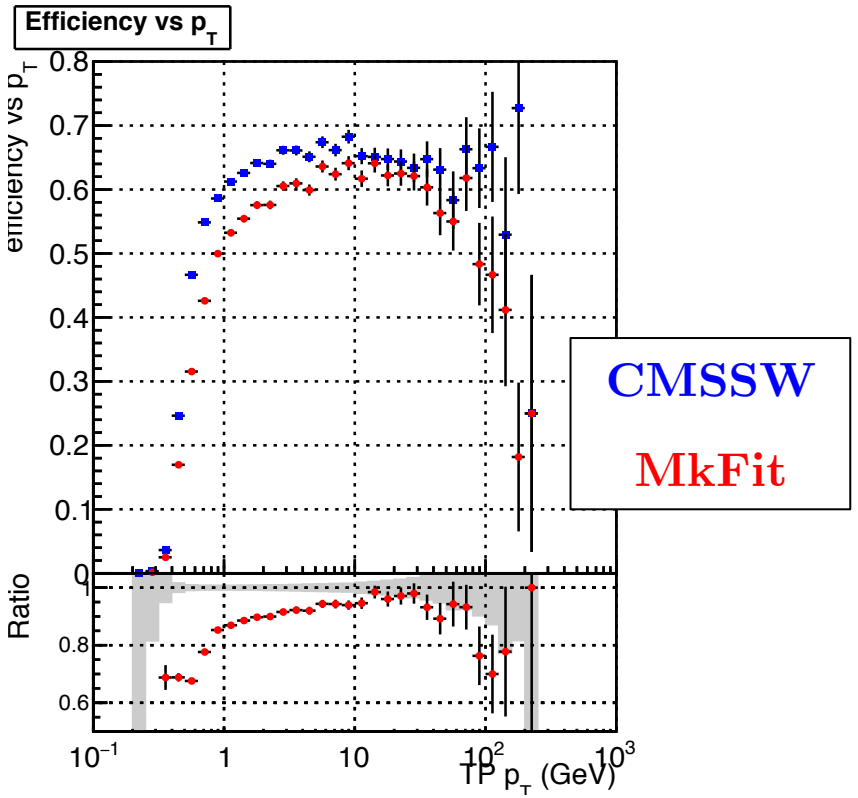




Efficiency vs p_T

- Using TTbar PU 70 sample for standalone mkFit (left)
- Using TTbar PU 50 sample for mkFit as CMSSW external (right)





mkFit Validation **MTV**