Jet reclustering and close-by effects in ATLAS Run 2

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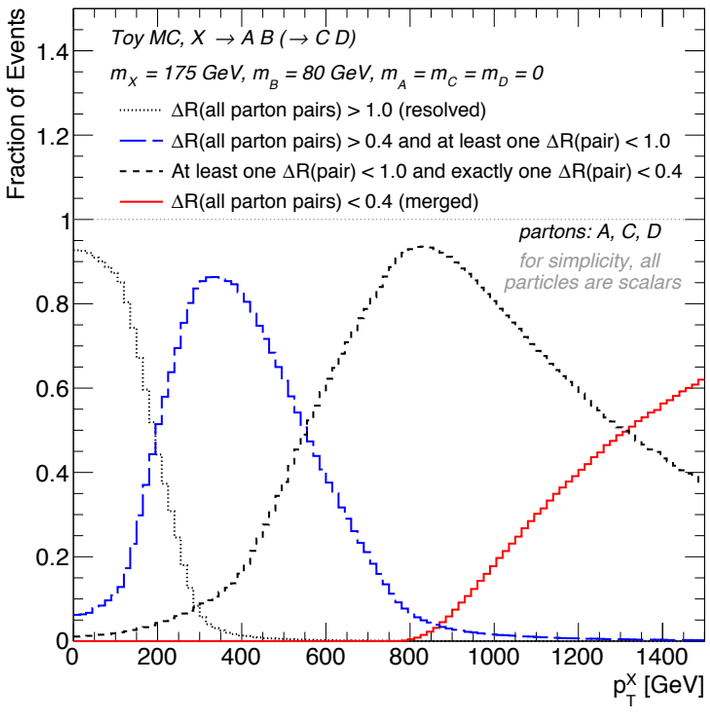
Jet reclustering [1,2] makes use of calibrated small-R jets as inputs to large-R jet reconstruction.

Reclustering has been applied in many ATLAS **searches for supersymmetry and exotica** throughout Runs 1 and 2 of the LHC:

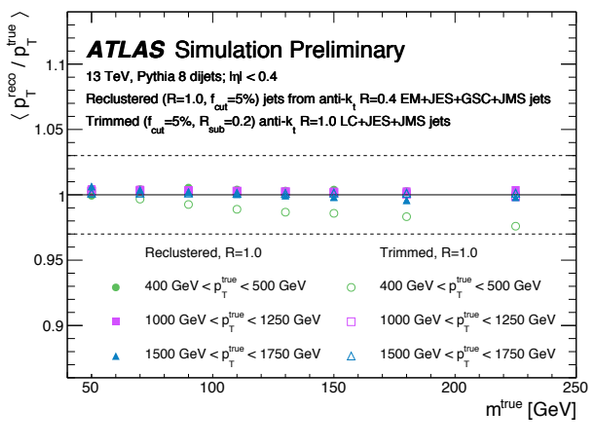
- **To reconstruct high-p_T bosons and top quarks.**
- **To exploit the structure of complex hadronic final states** [3].

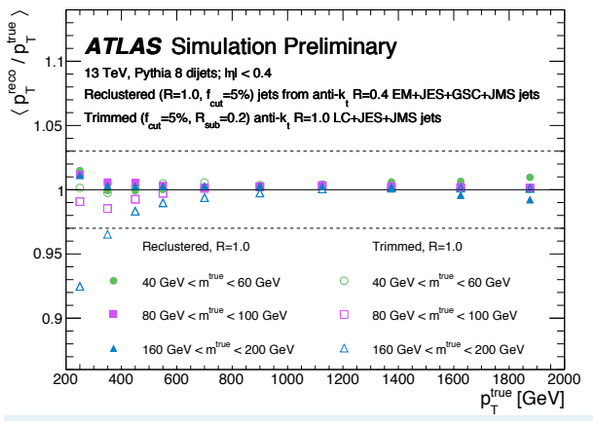
Propagation of calibrations and uncertainties from the well-understood anti-k_t *R*=0.4 jet collection [4] leverages our detailed understanding of these objects, and provides **greater flexibility for analysis optimisation.**



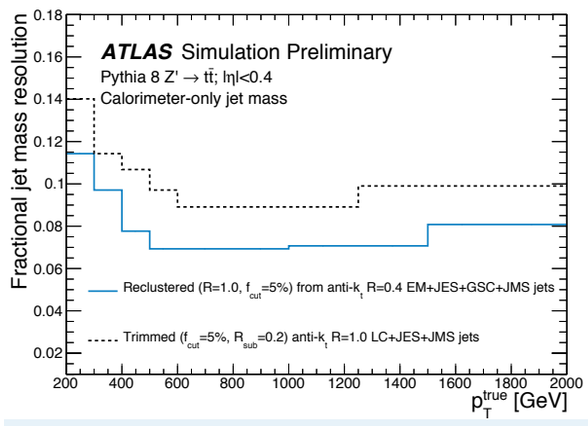
Calibrations

The calibrations propagated from the reclustered input anti-k_t *R*=0.4 jets are observed to restore the average mass and p_T values of large-*R* reclustered jets to their particle-level values.



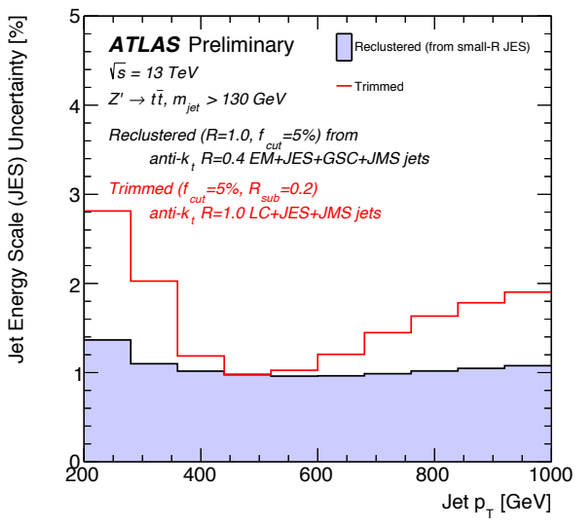


Improvements of up to 29% are observed in the mass resolution of reclustered large-*R* jets matched to top quarks.

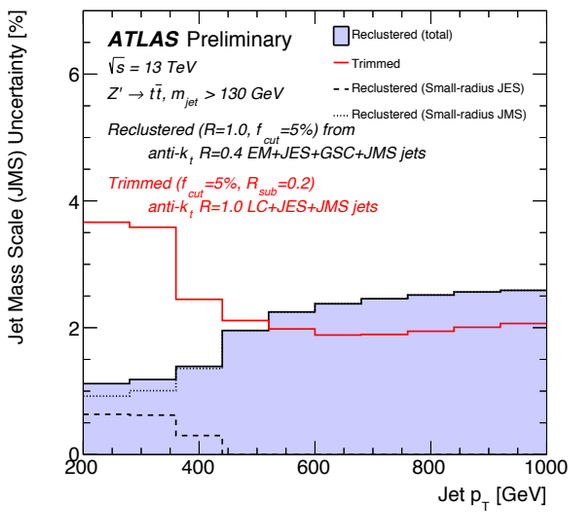


Uncertainties

The reclustered large-*R* JES uncertainty propagated from the input jets is smaller than the same uncertainty of trimmed large-*R* jets with p_T below 1 TeV for jets matched to top quarks.

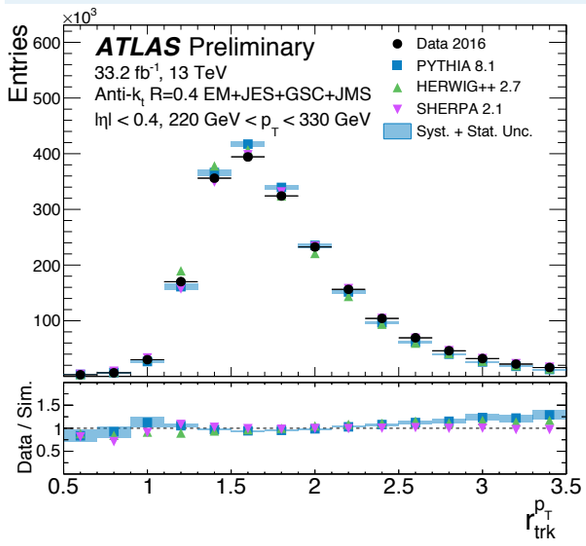


The propagated JMS uncertainty to reclustered large-*R* jets is also found to be smaller than the JMS of trimmed large-R jets with p_T below 450 GeV, for jets matched to top quarks.

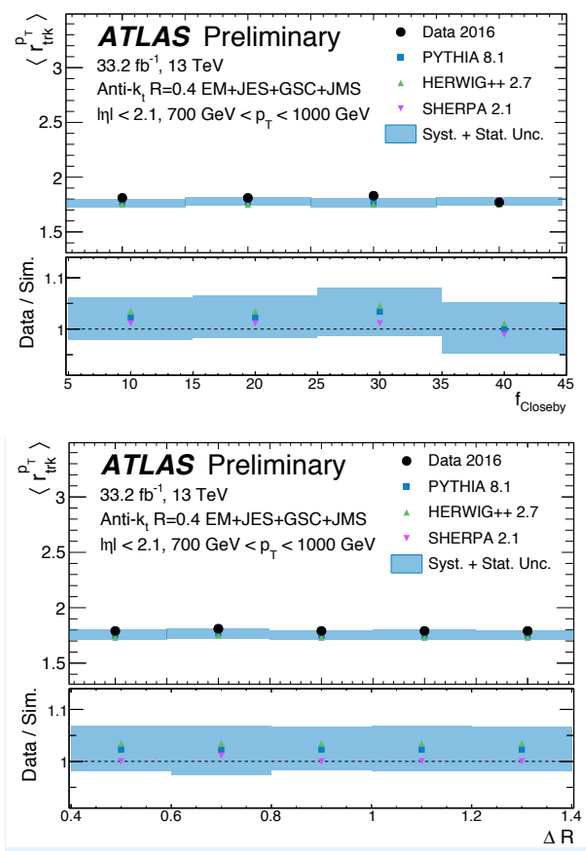


Close-by effects

Close-by effects of radiation on jets in the regime relevant to jet reclustering are found to be well-modelled using track-based techniques.



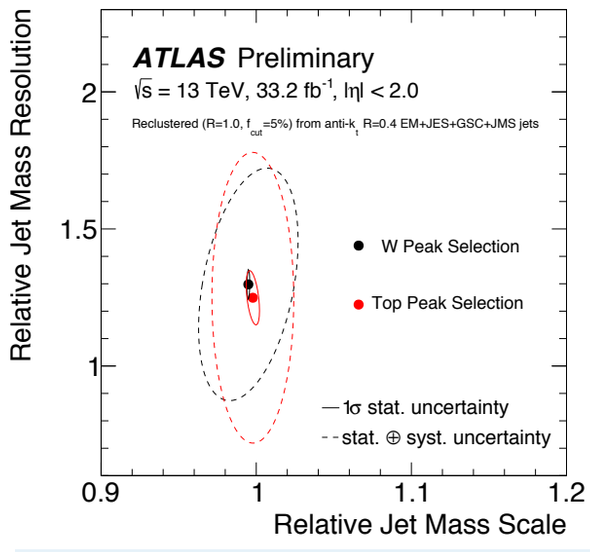
Additional uncertainties to account for close-by effects are found to be unnecessary in the context of reclustering.



In situ studies

Good agreement between the reclustered large-*R* jet mass in data and simulation is observed for a sample of high-p_T top quark jets.

The relative jet mass scale and jet mass resolution are extracted using a forward-folding procedure for reclustered jets matched to high-p_T *W* bosons and top quarks. Both are observed to be consistent with unity.



[1] Nachman et al. JHEP 02 (2015) 075 [2] The ATLAS Collaboration, ATLAS-CONF-2017-062
[3] The ATLAS Collaboration, ATLAS-CONF-2016-052 [4] The ATLAS Collaboration, arXiv:1703.09665