AtlFast3: The Next Generation of Fast Simulation in ATLAS

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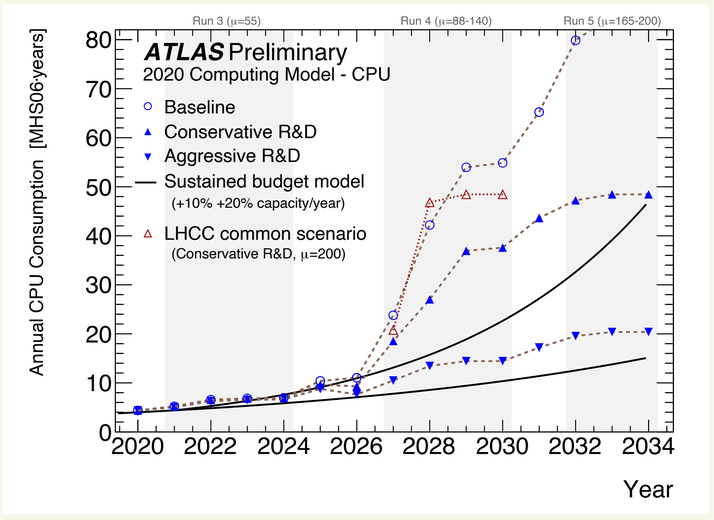
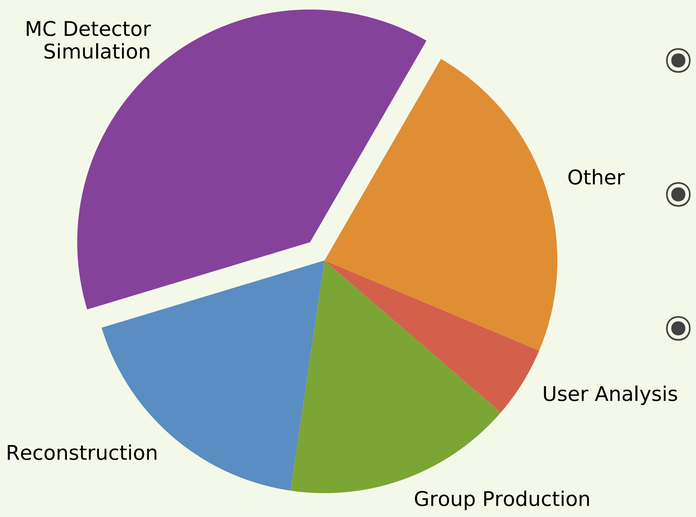




- **80-90%** CPU time of detector simul spent on **calorimeter**
- Previous fast simulation tool AFII limited in physics performance
- New fast simulation needs to address both precision and speed

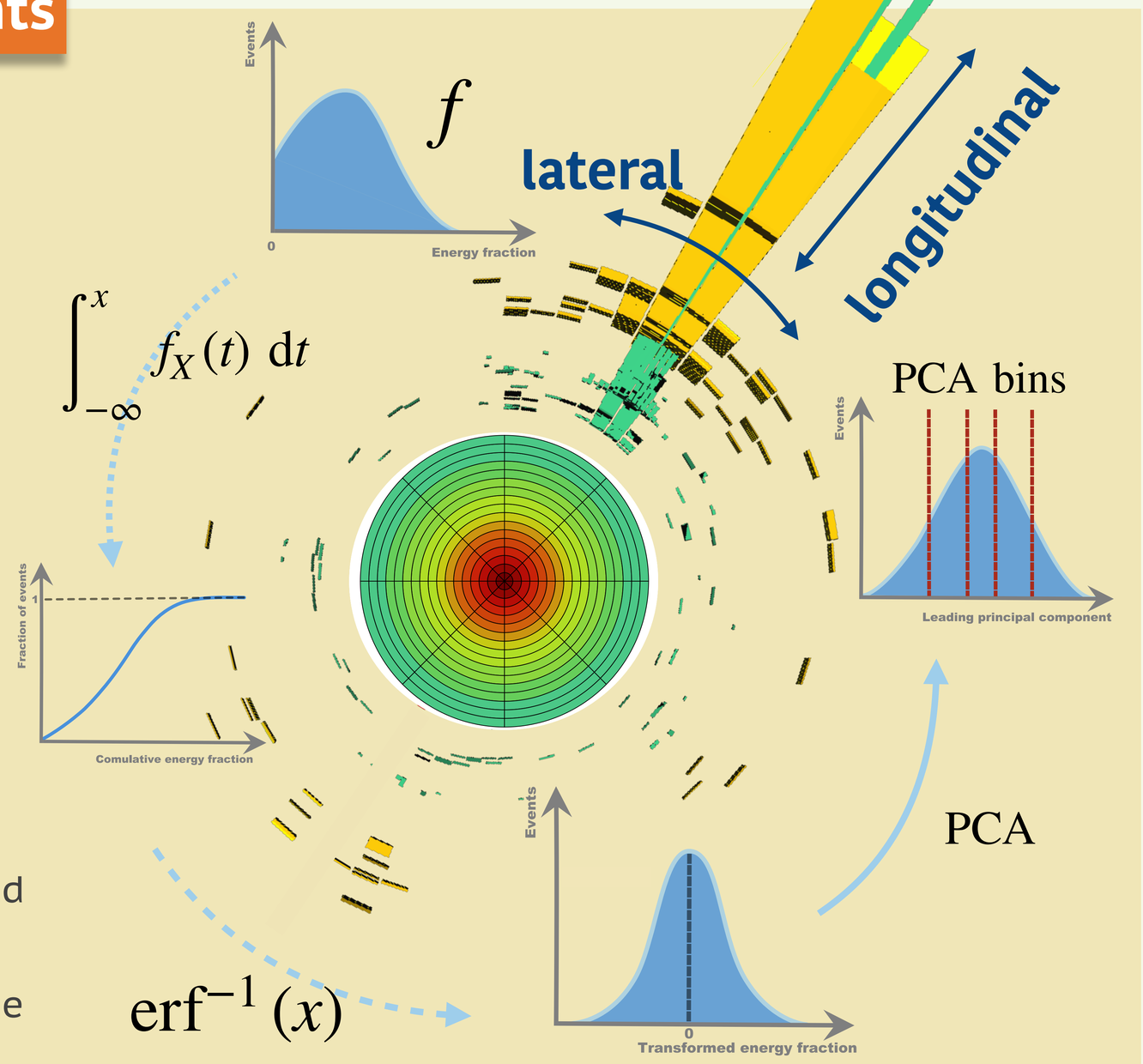
AtlFast3 Strategy: two components

FastCaloSimV2

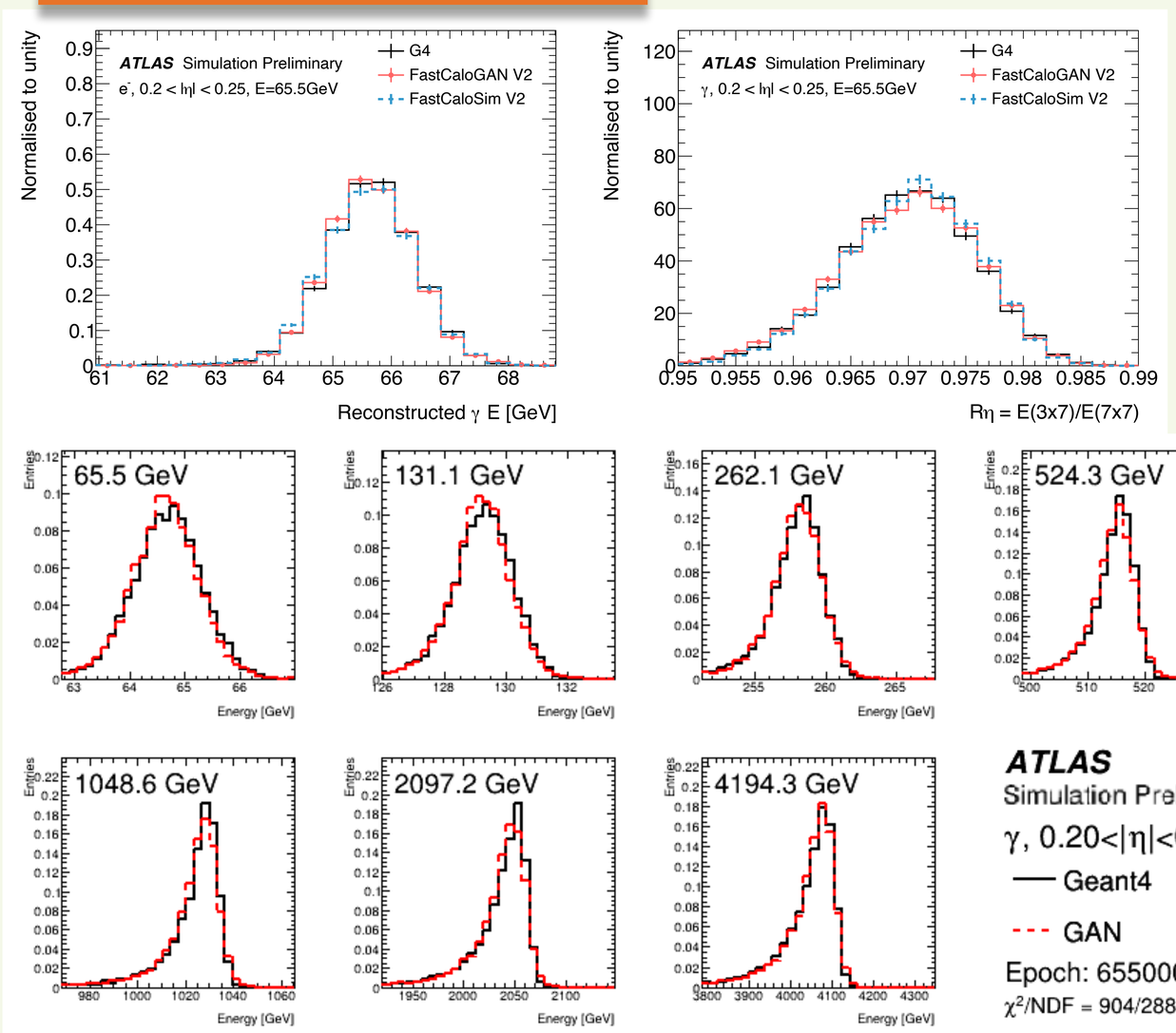
- Parametrise Geant4 single particle shower
  - 17 energy bins × 100 |η| bins
  - Separate in longitudinal and lateral shape
- Deposits highly correlated between layers
  - Using Principal Component Analysis (PCA)
- Average lateral energy distribution parametrised as 2D probability functions

FastCaloGAN

- 500 Wasserstein Generative Adversarial NN in particle type & |η|, conditioned on true momenta
  - Reproduce voxels and energies in layers and total energy in a single step
- Used for hadrons in intermediate energy range



Latest performance



Good agreement between AF3 and Geant4

A step further: tuning to Data

- So far AltFast3 is trying to reproduce Geant4 simulation.
- Known differences between G4 and data
- **Tune AF3 to data!**
- Preliminary results look promising