

Geant4 in *ATLAS*

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Geant4 Technical Forum

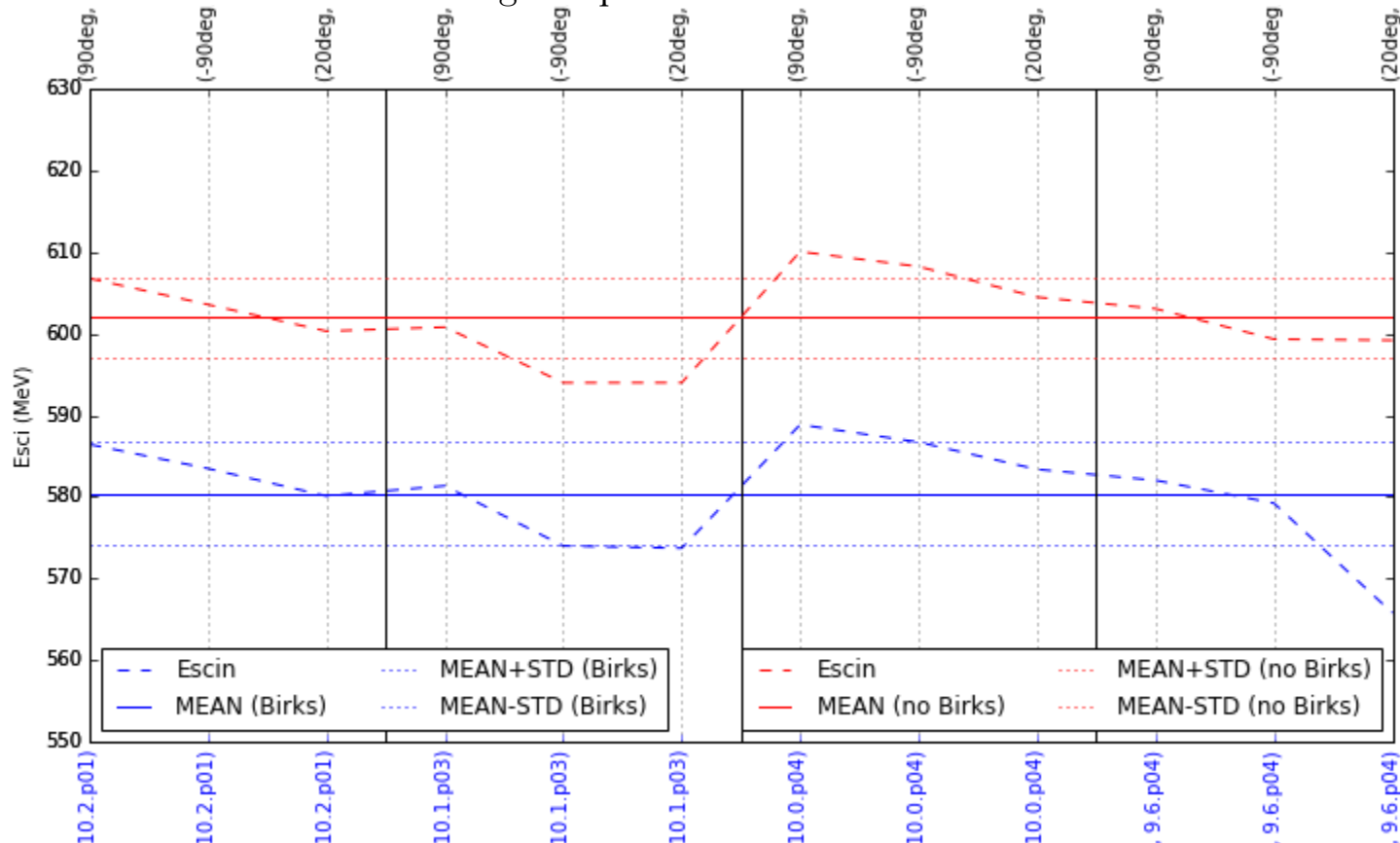
23 March 2016

Current Production

- Running 13 TeV MC production for the 2015 run (MC15)
 - Geant4 9.6 patch03 (validating patch04 soon), CLHEP 2.1, 64-bit, gcc 4.7, SLC6, C++11; this is (still) our platform through mid-2016
 - Enormous number of ATLAS-specific updates (geometry and detector response), including several speed ups
 - Moving to our new “ISF” infrastructure by default
 - Starting to run production on more exotic machines: HPCs, Amazon cloud, BOINC all being validated; ~few 10^7 events simulated
- Still running tails of (much) older productions
 - Geant4 9.4+ patches for “MC12” production
- Getting ready for launching of MC16 (!)
 - Expecting pre-production in April, bulk production in June
 - Geant4 10.1, CLHEP 2.2, 64-bit, gcc 4.9, SLC6, C++14
 - Expecting this to be the main production platform through 2016-2017
 - More serious tests of clang and AMD porting; still testing ICC, Mac OS X builds (but no production plans)

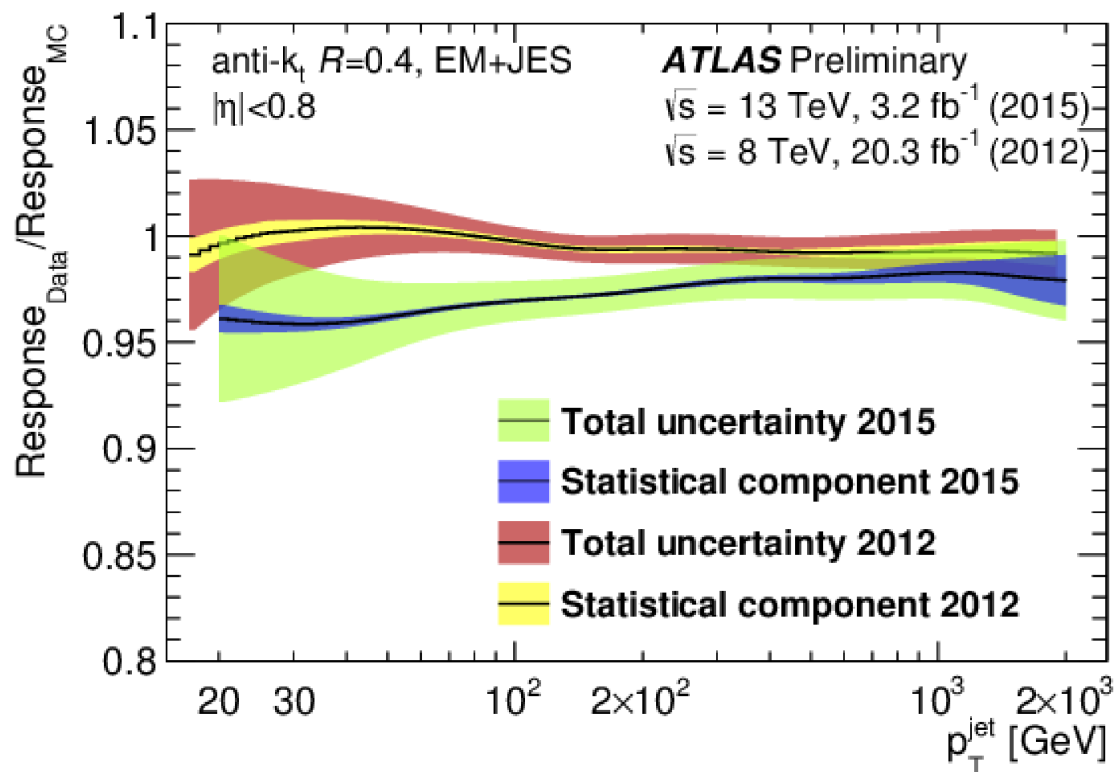
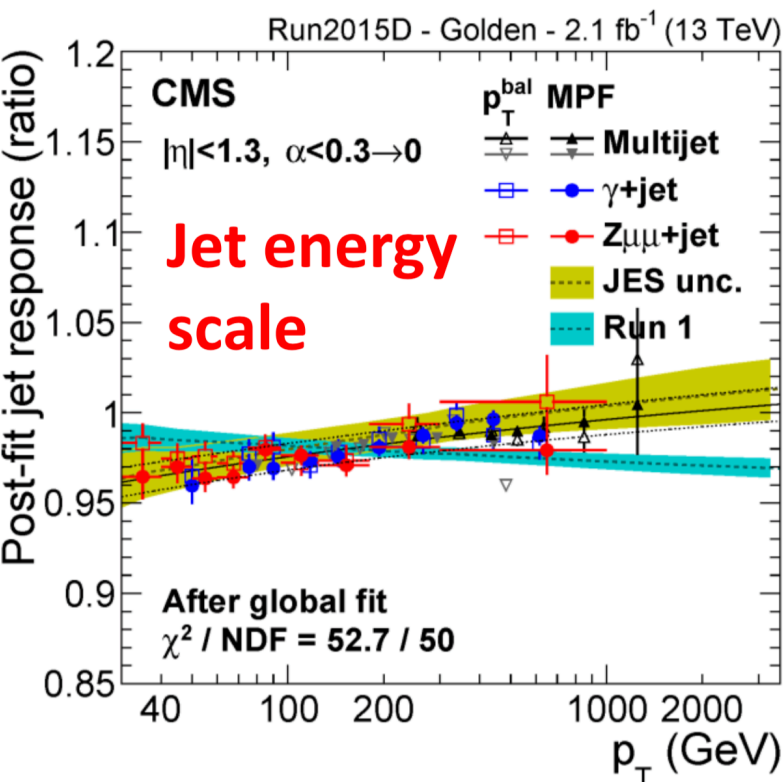
Helpful Investigations

- Got cross section uncertainties for upcoming hadronic interactions paper (thanks Andrea and Alberto!)
 - This was really helpful; probably this should be a ‘public’ Geant4 tool
- EM scale change investigations also helped with G4 10 confidence
 - Still need to understand angle-dependence



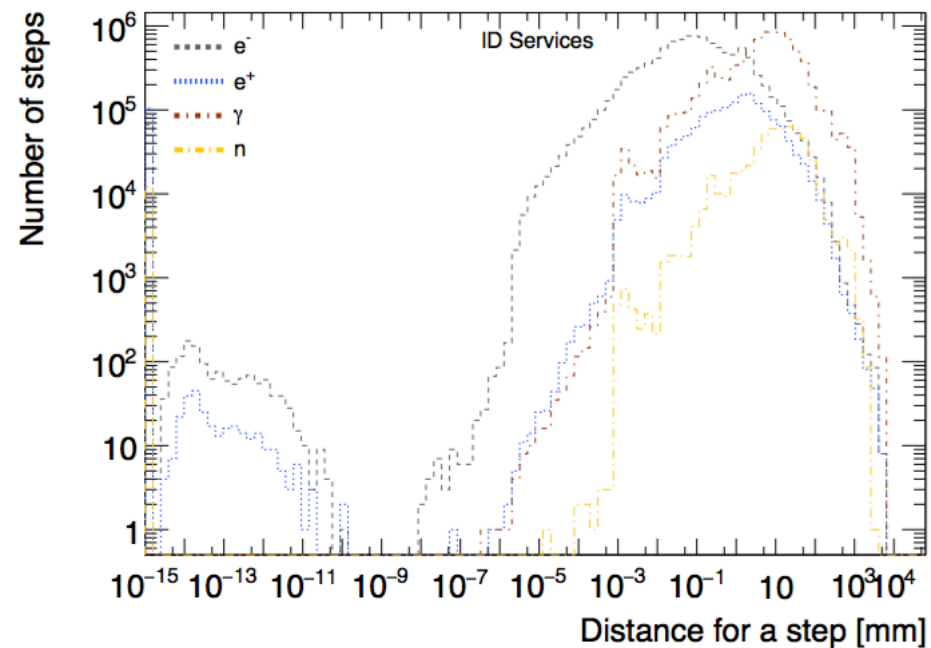
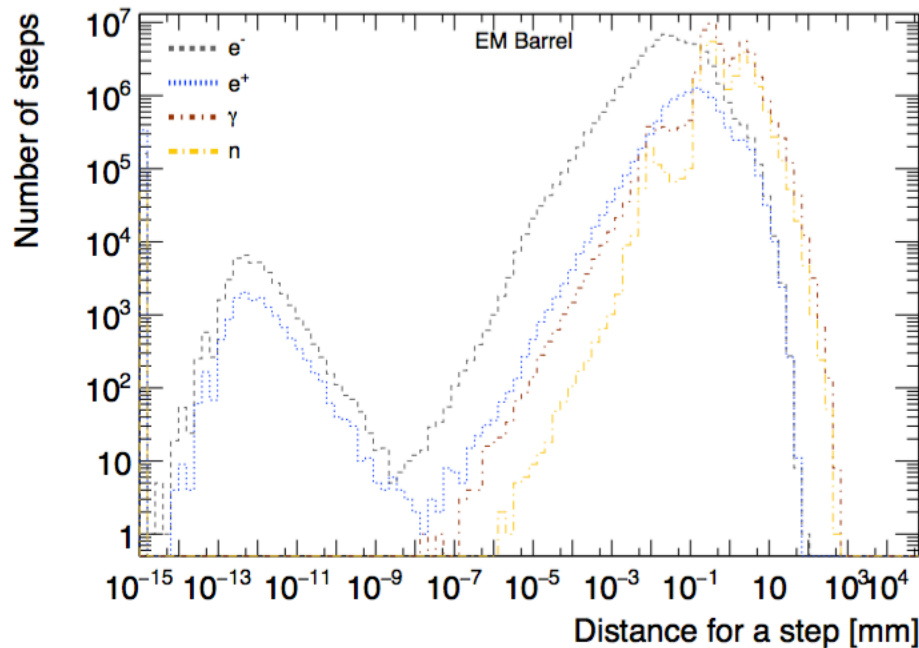
Continuing JES Issue

- There appears to be a low- p_T scale change between our run 1 and run 2 simulations. Still trying to pin this down.
- This has become one of the highest priority “physics” items for us to understand in the simulation...



Bugs and Crashes

- G4 10.1 crash rate seems to be no higher than G4 9.6
- Still testing to confirm that the new MultiLevelLocator patch in G4 10.1 reduces the crash rate as expected
 - First indications are good
- Small step issue appears to still be with us, even after this patch



Miscellanea

- Slightly annoying field design issue discovered around the time of the last G4TF – any hope to resolve this?
 - Reminder: G4FieldManager and G4Stepper own copies of the field pointer, and even for steppers owned by specific managers these are not required to be in sync.
- Taking hadronic cross sections from a DB instead of small files?
- Infrastructure upgrades, mentioned last time, are largely in validation
 - Rewrite of simulation code to be more Athena/Gaudi-friendly; introducing concepts of tools and services, matching Geant4 concepts like sensitive detectors and user actions
- G4MT Trial / prototype in testing for some time now
 - Making some serious progress on GaudiHive running with G4 10.1
 - All geometry ported, all but calorimeter SDs ported
 - Field infrastructure and truth code are the last remaining pieces; expected to be validated by summer
 - Thank you for the help and for the interface tweaks (multi-SD, multi-user-action, changes to const-ness) that we have discussed to make our lives easier!
- Starting to look at biasing options for producing some “fake” samples

Cool Things Coming

- Paper on hadronic interactions in the inner detector
- Paper on calorimeter particle response
- Several interesting studies of secondaries (multiplicity and species) from hadronic interactions
- Several students starting on:
 - Optimization of CPU
 - Optimization of memory (including small/frequent heap allocations)
 - Already this is pointing to voxelization during init
 - AMD/Intel reproducibility questions
 - “Physics” benchmarking (small steps, hyperspace...)
- Looking forward to the next tech forum!