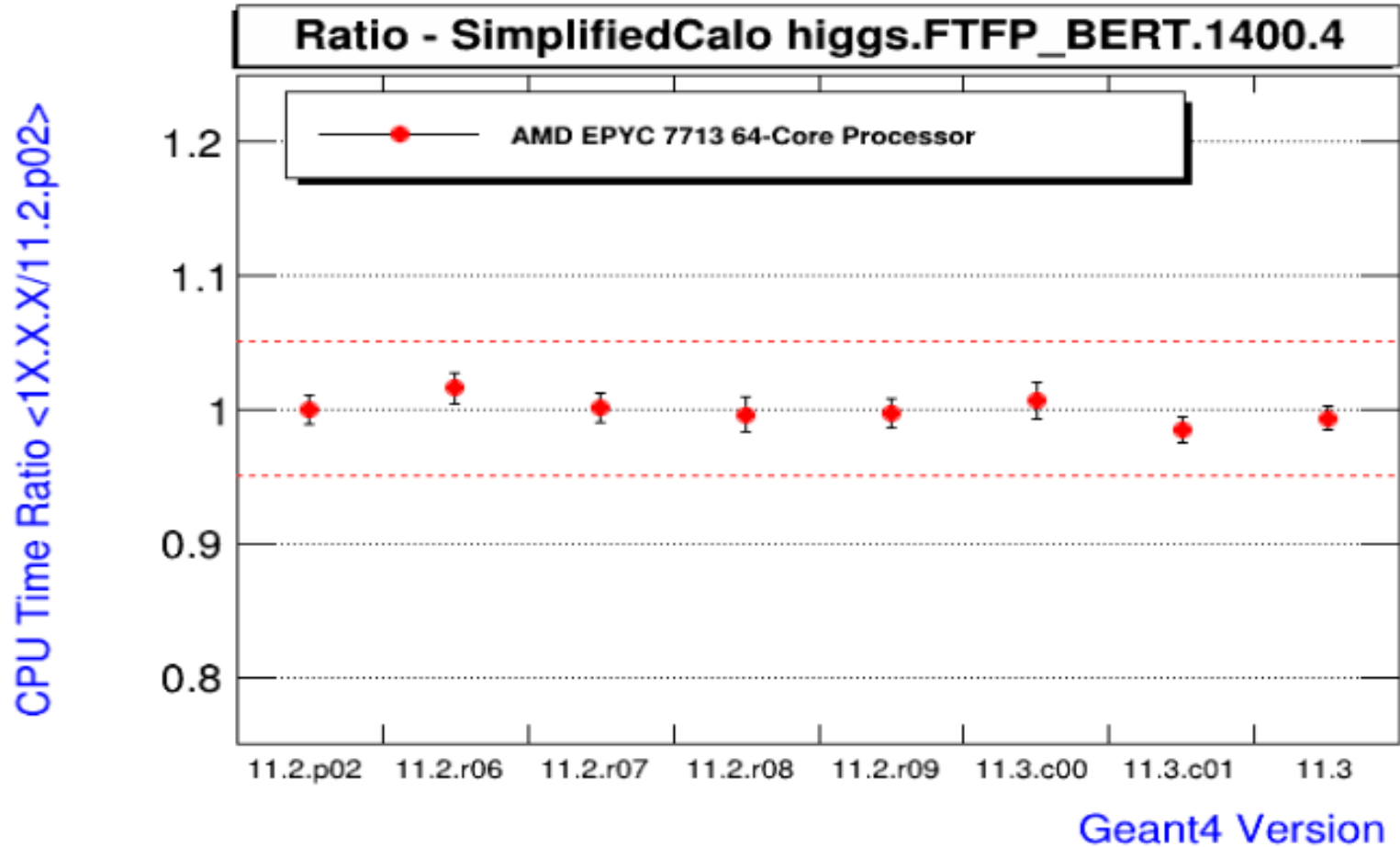# EM physics validation results for 11.3 and plans for 2025

V. Ivantchenko
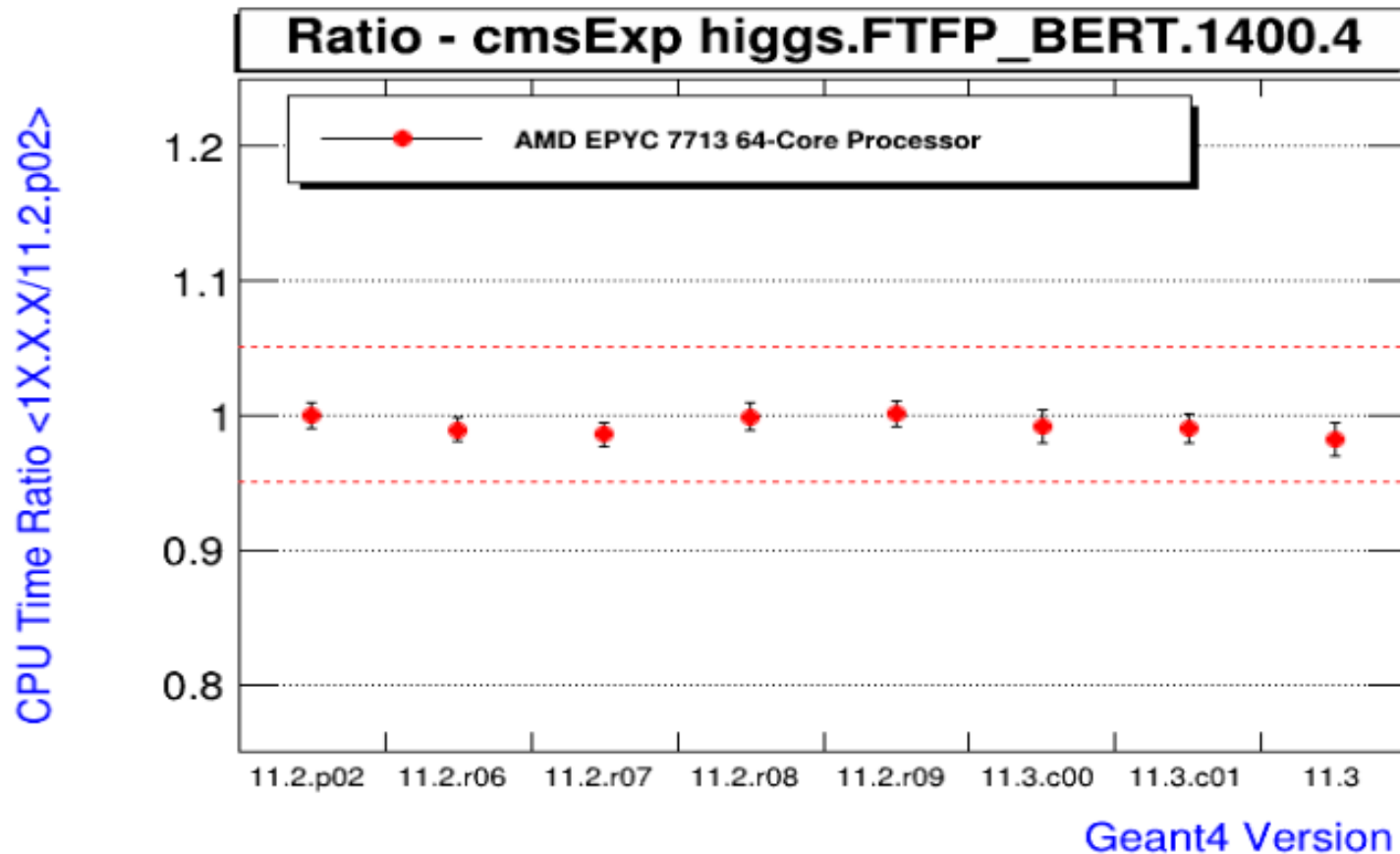
CERN & JINR, Dubna, Russia

26 November 2024

FNAL Geant4 Profiling (J. Yarba)

Ratio - SimplifiedCalo higgs.FTFP_BERT.1400.4

FNAL Geant4 Profiling (J. Yarba)

Test Results

- Testing results will be available:
  - https://ivanchenko.web.cern.ch/electromagnetic/
- EM results are stable since 11.1.X

Ideas about 2025 plan

General infrastructure

- Parallel initialization of physics for limited number of particles
  - gamma, e+, e-, mu+, mu-, and others
- Complete code formatting in EM libraries
  - Only by EM group members

Standard, muons, and low-energy

- Implement e-bremsstrahlung on electrons
  - background for dark matter search
  - EM shower shape

- Extend angular generators for EM models
  - extend system of unit tests
  - at low-energy try to use 2BN
  - for muons try to use new GeRi generators
  - make cross check with Penelope

- EPICS-2017 x-section for the Compton as an alternative
  - Build set of options on top of any Physics List to study triplet effects on shower shape

X-rays and optical

- Introduced model approach for Cerenkov and Scintillation processes
  - Develop X-ray model interface
  - Develop UI configuration commands to select a model per G4LogicalVolume

- Add smart methods to assign surface properties
  - Per G4LogicalVolume and per G4VPhysicalVolume

Adept as EM library

- Should we start making an example within examples/extended/electromagnetic, which will use G4HepEM and AdePT components?
  - Initially usage of available lab GPU
  - The target may be a personal PC of a user
  - Not necessarily big advantage in speed
  - Not necessarily full physics
  - We can start activity after March assessment