



NUCLEAR LEVEL DATA

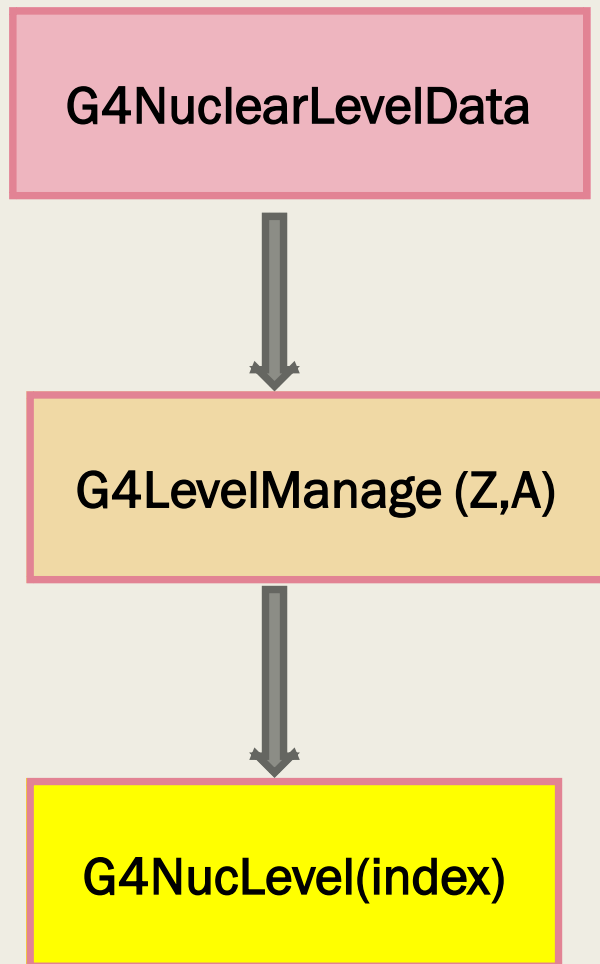
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Nuclear level data



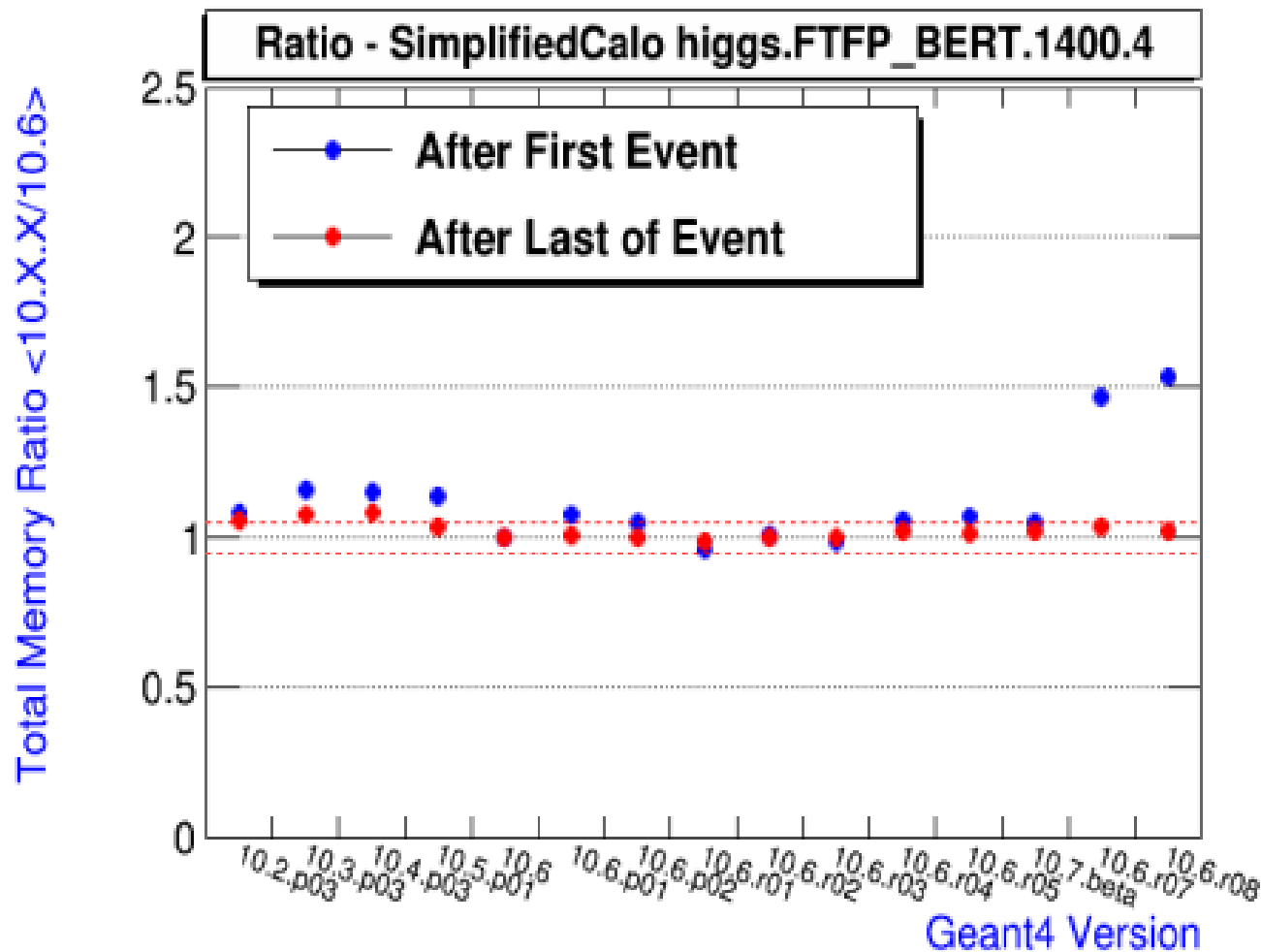
- Since 10.3 we have nuclear level data handled by `G4NuclearLevelData` class
 - Static singleton shared between all threads
 - In 10.5 we had only lazy initialization per isotope
 - In 10.6 two possibilities
 - lazy initialization of the data per isotope badly interacts
 - On demand initialization of all needed isotopes before the run
- The memory used by nuclear level data
 - Full data (all levels are uploaded) takes **56 MB**
 - Data without e- internal conversion coefficients **8 MB**

Nuclear level data

- Recently Gabriele identify a bug in MT mode in G4NuclearLevelData class
 - *In 10.6 lazy initialization of the data per isotope badly interacts with implementation of initialization of all needed isotopes before the run*
 - *The fix was provided with 10.6beta*
- The fix is implemented and already merged also to the master and to the 10.6 patch branches
 - *In the new variant of initialization, in BuildPhysicsTable() method the G4ExcitationHandler calls download nuclear level data for all isotopes with $Z \leq Z_{\max}$*
 - *Z_{\max} is defined from the material list*
 - *For $Z > Z_{\max}$ the lazy initialization remains*
 - *CPU penalty at initialization is about 1-2 seconds at pcgeant06*

Memory profile (FNAL group)

https://g4cpt.fnal.gov/g4p/summary/mem_SimplifiedCalo_higgs.html



Plans

- Makoto pointed out that having data structure with many small files makes problems for HPCs:
 - *Lazy initialization is difficult at this architecture*
 - *Reading of many small files at initialization is also a problem*
- Proposed solution:
 - *Produce one big binary file from these ASCII files*
 - *G4NuclearLevelData::DumpData(const G4String& file)*
 - *Added extra Boolean parameters ReadASCII*
 - *Create 2 binary files*
 - *One for HEP - no internal e- conversion*
 - *Second - full data*
 - *May be implemented for the next release*