New Developments of ROOT Mathematical Software Libraries

The Math work package of the ROOT project provides to the LHC experiments the needed mathematical and statistical computational methods as a coherent set of C++ libraries. The new developments of this work package formed from the merge of the ROOT and SEAL activities will be presented. A new core library, MathCore, has been developed as a self contained component with the basic mathematical functionality. This consists of special and mathematical functions used in statistics, random number generators, physics vectors and numerical algorithms such as integration and derivation. The MathMore library provides instead a complementary and larger set of C++ mathematical functions and algorithms, some of them based on existing mathematical library such as the GNU Scientific library. Wrapper to this library are written in C++ and integrated in a coherent object oriented framework. Other new developments include the the new version of MINUIT, re-written in C++, or the linear and robust fitters. The functionality currently provided by these new libraries and their design will be described in detail. Results of the validation tests applied to verify the quality of the mathematical libraries will be as well presented.