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New Developments of ROOT Mathematical Software Libraries

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LHC experiments obtain needed mathematical and statistical computational methods via the coherent set of C++ libraries provided by the Math work package of the ROOT project. We present recent developments of this work package, formed from the merge of the ROOT and SEAL activities:

(1) MathCore, a new core library, has been developed as a self contained component encompassing basic mathematical functionality: special and mathematical functions used in statistics, random number generators, physics vectors, and numerical algorithms such as integration and derivation.

(2) The new MathMore library provides a complementary and expanded set of C++ mathematical functions and algorithms, some of them based on existing mathematical libraries such as the GNU Scientific library. Wrappers to this library are written in C++ and integrated in a coherent object oriented framework.

(3) The fitting libraries of ROOT have been extended by integrating the new C++ version of MINUIT and adding the linear and robust fitters.

We will provide an overview of the ROOT Mathematical libraries and will describe in detail the functionality and design of these packages recently introduced in ROOT. We will also describe the planned improvements and redesign of old ROOT classes to use the new facilities provided by MathCore and MathMore.

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