Contribution ID: **78**   Type: **Oral**

Automatic numerical integration methods for Feynman integrals through 3-loop

Tuesday, 2 September 2014 14:50 (25 minutes)

The paper will include numerical integration results for Feynman loop diagrams through 3-loop such as those covered by (Laporta, 2000). While Laporta generated solutions by solving systems of difference equations, the current methods are based on automatic adaptive integration, using iterated integration with programs from the QuadPack package, or multivariate techniques from the ParInt package. The QuadPack programs have been parallelized with OpenMP for multicore systems. In particular, the Dqags algorithm allows handling boundary singularities of fairly general types. ParInt is a package for multivariate integration layered over MPI (Message Passing Interface), which runs on clusters and incorporates advanced parallel/distributed techniques such as load balancing among processes that may be distributed over a network of nodes. We will give results for 3-loop self-energy diagrams without IR (infra-red) or UV (ultra-violet) singularities, and 2-loop self-energy diagrams with UV terms. The latter can be treated with automatic numerical integration allowing for boundary singularities, and numerical extrapolation. These cases include 2-loop self-energy diagrams with three, four and five internal lines.

Primary author: Prof. DE DONCKER, Elise (Western Michigan University)

Co-authors: Dr YUASA, Fukuko (High Energy Accelerator Research Organization (KEK), Japan); Prof. KATO, Kiyoshi (Kogakuin University); Mrs OLAGBEMI, Omofalakunmi (Fola) (Western Michigan University); Dr ISHIKAWA, Tadashi (High Energy Accelerator Research Organization (KEK), Japan)

Presenter: Prof. DE DONCKER, Elise (Western Michigan University)

Session Classification: Computations in Theoretical Physics: Techniques and Methods

Track Classification: Computations in Theoretical Physics: Techniques and Methods