ESR Project 10
Two-Loop QCD Amplitudes for Next-to-Next-to-Leading Order Calculations at the LHC

Sebastian Pögel

Institute: IPhT, CEA-Saclay, France

1st Supervisor: David Kosower
2nd Supervisor: John Joseph Carrasco
Mentor: Lance Dixon

SAGEX
Scattering Amplitudes: from Geometry to Experiment

Personal Background

- Originally from Germany

- Bachelor and Master from RWTH Aachen University in Germany

    – Both theses in group of Prof. Michael Krämer

    – Predictions for new physics searches at collider experiments

- During Master, 10 months of studies in Paris through Erasmus+

SAGEX Project

- **Goal:** Calculations and tool development for precision LHC physics

- **Projects:**

  - Current project: Computation of rational terms of simplest (all-plus) two-loop QCD amplitude at arbitrary multiplicity

    - Develop techniques to be applied to more complicated two-loop QCD amplitudes

  - Planned project: Software library for efficient evaluation of Mellin-Barnes integrals
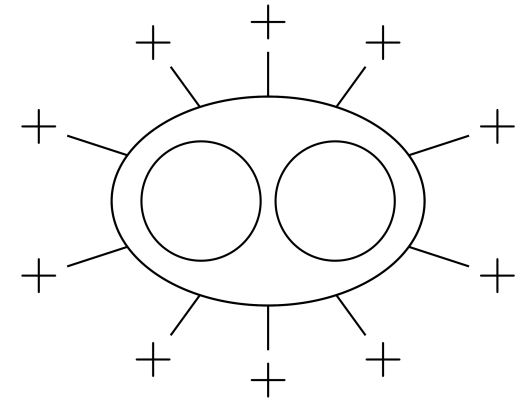
Interactions within Network & Training Events

- **Excellent experience connecting with other network members**
  - Good rapport with advisor David Kosower
  - Early contact with mentor Lance Dixon
    - Visits to Freiburg (three days last April) and Zürich (two weeks last June)
  - SAGEX events helped connecting well with ESRs

- **Training:**
  - 1st SAGEX School and Scientific Workshop
  - Amplitudes 2019
  - French language classes (at institute)
  - Other schools, local courses, workshops, and conferences
    (CERN Winter School, ETH Zürich Modular Forms School, "Black Holes and Microstate Geometries" [IPhT course],
    "Lorentzian Methods in CFTs" [IPhT course], Freiburg Mini-Workshop [NNLO], Multi-loop Calculations conference, RadCor conference)

Secondments & Outreach

- **Private Sector Secondment:** RISC Software GmbH
  - Time Frame: Planned May to July 2020
  - Project: Medical applications of machine learning image recognition
  - Collaboration with other ESRs (Canxin Shi, Kays Haddad)
  - Due to time constraints, no additional secondment planned

- **Scientific Secondment:** Plan to stay ~1 month at SLAC, with Lance Dixon

- Outreach:
  - SAGEX Twitter account March & April 2019
  - Planning of SAGEX exhibition
  - Video project with Ekaterina Eremenko

Future

- **Career goals:**

  - Short Term:

    - Postdoctoral positions in amplitudes research

  - Long Term:

    - Academic career, open to switch to industry (e.g. software development)

- **SAGEX network ideal stepping stone:**

  - Establish contacts in research field for postdoctoral positions

  - Secondment at RISC offers first view of industry positions