

# The Evaluation of the Leading Hadronic Contribution to the Muon Anomalous Magnetic Moment



**Monday, February 19, 2018 - Friday, February 23, 2018**

**Mainz Institute for Theoretical Physics, Johannes Gutenberg University**

## Scientific Program

The scientific programme is articulated in five days, with presentations and plenty of time for discussions, according to the following scheme:

### **Overview of the status of the muon g-2**

Presentations will cover the status of the new E989 experiment at Fermilab and the novel technique of the ultracold muon beam being developed by the E34 collaboration at J-PARC. On the theoretical side, presentations will address the muon g-2 prediction in the Standard Model and some of its extensions. Emphasis will then be placed on the hadronic corrections to the muon g-2 and, in particular, on a new space-like approach to determine its leading contribution.

### **State of the art of precision calculations for Bhabha and $\mu$ -e scattering**

The existing analytical precision calculations for Bhabha scattering and for  $\mu$ -e will be addressed, at NLO and NNLO accuracy; the roadmap leading to a NNLO precision calculation for  $\mu$ -e scattering will be designed.

### **State of the art of Monte Carlo simulation codes for the processes under consideration**

Contributions from the teams that developed and are developing high-precision Monte Carlo event generators are planned. The possibility of implementing into a simulation code NNLO calculations will be analyzed and discussed.

### **The $\mu$ -e experiment**

The experimental challenges posed by measuring the effective electromagnetic coupling in the space-like region at low-momentum transfer with high precision will be addressed.

The ideas of performing the measurement by means of the 150 GeV muon beam (currently available at CERN North area) on atomic electrons, as well as by means of the Bhabha process at flavour factories, will be analyzed in detail.

The needed optimizations for a detector able to keep the systematic effects at the required level of 10 ppm will be discussed. In particular, the following items are expected to be covered:

- 1) Modeling the multiple scattering of the target;
- 2) Detector simulation and optimization of the target;
- 3) Tracking system (Si detectors);
- 4) Robust particle identification.

### **Discussion and future work**

The last day will be devoted to an open and thorough discussion on the items covered during the workshop and to identify all possible developments.