Scientific Area	High Energy Physics – Lattice Quantum Chromodynamics		
Project Title	Computation of the anomalous magnetic moment of the muon using twisted mass fermions		
Recruiting Institution	The Cyprus Institute		
PhD awarding Institution	The Cyprus Institute	**PhD Duration**	36 Months
Supervisor/Institution	Constantia Alexandrou/ University of Cyprus and The Cyprus Institute		
Co-Supervisor/Institution	Kyriakos Hadjiyiannakou, University of Cyprus		
Secondment(s)	Secondments will be arranged as per project needs at DESY-Zeuthen, Rome Tor Vergata or Bonn University		

Project Description

The anomalous magnetic moment of the muon, $(g_\mu - 2)$ computed within the Standard Model exhibits disagreement with the experimental measurement of BNL that has been confined very recently by Fermi Lab, by around 4 standard deviations. A recent computation within Lattice QCD brought agreement with the experimental value but still disagrees with phenomenological results. Fermi Lab is planning in reducing the error on the experimental value and it thus important for theoretical calculations to also reduce the error. If such a disagreement is confirmed, it would provide the first proof of new Physics beyond the standard model which will revolutionize fundamental physics. One of the biggest uncertainties in the theoretical determination of $(g_\mu - 2)$ are hadronic contributions. The best approach to compute these are within lattice QCD. In this project we will use *ab initio* simulations to compute the hadronic contribution to $(g_\mu - 2)$ including disconnected contributions and electromagnetic corrections. This work will be done within the Extended Twisted Mass Collaboration involving researchers from DESY-Zeuthen, Bonn University and Rome Tor Vergata who have the collective expertise to undertake such a challenging calculation

Project Objectives

The objectives of the PhD project are:

1) To train the student in state-of-the-art techniques for the evaluation of observables relevant for the computation of $(g_\mu - 2)$ within lattice QCD
2) To compute the disconnected contributions
3) To perform the analysis of the resulting correlators and extract the hadronic vacuum polarization contributions
4) To present the results to the relevant physics communities

Required Candidate Qualifications

- BSc degree (or equivalent) in Physics
- MSc degree (or equivalent) in computational sciences, nuclear or particle physics or any relevant topic

Candidates with a strong Theoretical Physics background and computational skills and a keen interest in lattice quantum field theories will be favoured.