PAUL SCHERRER INSTITUT

Invitation

LMU-Seminar

Title: **Site metastability, local dynamics and electric field effects of spin polarized muons in Chromium Oxide**

Speaker: **Mr. Martin Dehn**
University of British Columbia, Canada

Time: **Wednesday, April 10th 2019, 10:00**

Place: **WBGB/019**

Abstract:

The well studied linear magneto-electric (ME) antiferromagnet Cr_2O_3 is subject of a renewed interest, driven both by promising ME device applications and the recent prediction that a point charge inside a linear ME creates a monopolar magnetic field distribution. Muon spin rotation (μSR) is an interesting and unique way to investigate such predictions since the muon may act both as a test charge and a sensitive probe of the local magnetic field. We carried out a comprehensive μSR study of Cr_2O_3 under zero field conditions and in applied magnetic and electric fields, significantly expanding the results from the early days of μSR. In particular, we observe up to three ZF spin precession frequencies, indicating three distinct muon environments with different internal magnetic fields. Small external magnetic fields along various symmetry directions split the observed frequencies into multiplets, providing detailed information on the symmetry of the internal fields at different muon sites, and stringent criteria for comparison with DFT-calculated candidate stopping sites. The temperature dependence reveals a rich dynamic behavior that we interpret in the context of local muon hopping and thermally activated site transitions. Notably, we find that a highly dynamic and a static site coexist. Supported by DFT calculations, this is explained by the formation of a stabilizing muon Cr^{2+} polaron complex. Furthermore, when Cr_2O_3 is prepared in a single magnetic domain, a shift in the local magnetic field is observed in response to an applied electric field, with the sign of the shift depending both on the field direction and domain state. The origin of this apparent magneto-electric effect will be discussed.