



PAUL SCHERRER INSTITUT

# Invitation

## LMU-Seminar

---

**Title:** Magnetism and Superconductivity in Fe-based Compounds - The Various Ways to Coexist

**Speaker:** Dr. Hubertus Luetkens (PSI, Switzerland)

**Time:** Friday, October 7, 2016 at 08:30

**Place:** WBBA/008

### Abstract:

Magnetism is a key element in the electronic phase diagrams of all unconventional superconductors, such as the high-T<sub>c</sub> cuprates, heavy-fermion, organic and Fe-based superconductors. This obviously suggests that magnetism should be at the heart of the explanation of this phenomenon. It is therefore of paramount importance that theories are rigorously tested against solid experimental data about the relation of magnetism and superconductivity.  $\mu$ SR is a powerful tool in this context since it allows e.g. studying the exact nature of the transition from an antiferro-magnetic to a superconducting phase in high-T<sub>c</sub> superconductors as a function of a control parameter like doping or hydrostatic pressure. Thereby, it is of special advantage that  $\mu$ SR as a local probe is sensitive to both the superconducting as well as to the magnetic volume fraction and to the respective order parameters, that fundamental microscopic parameters like the magnetic penetration depth can be determined absolutely and that  $\mu$ SR is extremely sensitive to small moment and short range magnetic order.

In this talk, I will present our  $\mu$ SR investigations on the microscopic coexistence, competition and coupling of the magnetic and superconducting ground states in Fe-based superconductors and related materials. Interestingly, we find various ways of how the magnetic and superconducting orders can coexist, namely in i) an electronically and structurally phase separated way, ii) with a competition about the volume, iii) with a competition about the magnetic moment, iv) a coexistence without apparent competition, and exotically v) with static magnetism being a necessary prerequisite for superconductivity.