

Local studies of superconducting and magnetic properties of thin films and heterostructures with spin polarized probes

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Spin polarized particles such as low energy muons (LE- $\mu^+$ ) or polarized nuclei act as non-destructive, non-invasive, and sensitive microscopic probes for local magnetic investigations (muon spin rotation/relaxation  $\mu$ SR,  $\beta$ -NMR).

They allow depth dependent studies on nm scale providing unique information in cases where order parameters or electronic properties are not homogeneous such as in heterostructures composed of different materials, thin films or near the surface of a crystal.

I will first present some LE- $\mu$ SR experiments including the determination of the magnetic penetration depth at the surface of unconventional superconductors, study of proximity effects in cuprate heterostructures, and investigations of magnetic properties in semiconducting films and devices relevant for spintronics applications.

To conclude I will report about investigations of superconducting fluctuations in low  $T_c$  materials with spin polarized  $^8\text{Li}$  nuclei.