High magnetic field ESR spectroscopy on FeAs-based superconductors

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In the introductory part of the talk possibilities and challenges of the sub-THz tunable ESR spectroscopy in strong magnetic fields for studies of strongly correlated electron spin systems will be briefly discussed.

Further in the talk, we will specifically address an intensively discussed issue of a possible interplay between magnetism and superconductivity in the iron pnictide high temperature superconductors. Recent systematic high field ESR studies at the IFW Dresden of the $GdO_{1-x}F_xFeAs$ and (Eu,Ba)$[Fe_{1-x}Co_x]_2As_2$ compounds will be presented. Interplay between the rare-earth and the Fe magnetic subsystems as revealed by Gd^{3+} and Eu^{2+} ESR will be discussed. The ESR data give evidence that though the long range magnetic order in the FeAs planes is suppressed upon doping, short range static on the ESR time scale magnetic correlations between Fe spins remain even up to the doping level optimal for superconductivity. This suggests that the studied compounds may feature coexistence of quasi-static magnetism and superconductivity on a large doping range which emerges as a generic property of iron pnictide superconductors.