

Horizontal field cryomagnets: Research opportunities for correlated quantum phenomena

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Strongly correlated electron systems often reveal ground states with deeply intertwined electronic charge, orbital, spin and lattice degrees of freedom. Their interplay can stabilise novel collective phenomena, whose understanding require the application of external parameters to determine the contributions of the various degrees of freedom. External magnetic fields are often ideal tuning parameters, because they can be controlled precisely, are compatible with low-temperature setups and the application of a few Tesla is often sufficient to drive the system into another ground state.

While vertical magnetic field cryomagnets are used for neutron scattering experiments in which the magnetic field direction is perpendicular to the horizontal scattering plane, horizontal field magnets are required when the field needs to be applied within the plane. In this presentation I will report on three research examples in which horizontal field cryomagnets were used to understand the magnetic interactions in correlated quantum phenomena. For each example the requirements in scattering geometry and field strength asked for a different horizontal field magnet from the sample environment suite at the Paul Scherrer Institut.