Novel superconducting quantum-structures based on the *d*-wave symmetry of the high-T_c cuprates

Hans Hilgenkamp

Low Temperature Division, Applied Physics Department
and MESA$^+$ Research Institute
University of Twente, Enschede, The Netherlands
h.hilgenkamp@tn.utwente.nl

The predominant *d*-wave symmetry of the high temperature superconductors provides the opportunity to realize novel Josephson quantum-structures, characterized by build-in π-phase shifts. Such elements are of interest for basic studies and have also been proposed as new components in superconducting (quantum)-electronics. Starting with an introduction on the effects of the *d*-wave order parameter symmetry on high-T_c Josephson junctions, the fabrication and characteristics of various novel *d*-wave quantum-structures will be discussed. These include π-SQUIDs based on grain boundaries and on thin film contacts between high-T_c and low-T_c superconductors, and 1-D and 2-D arrays of corner junctions. The latter structures display intriguing effects, such as the spontaneous formation of coupled magnetic half-flux quanta, which can be used to construct strongly frustrated systems.