MICROKELVIN: European Microkelvin Collaboration

It is an unfortunate truth that electronics has not had any innovations in close to a decade – a change is needed. Coherent electron circuitry could be this change. However, coherent electron circuitry needs larger electron scattering lengths and high levels of purity. Therefore there is a need to work at extremely low temperatures – milli- and microkelvin levels – to reduce thermal scattering. While there is strong demand for very low temperature facilities, there is a lack of expertise and infrastructure to have greater microkelvin experiments. As such, MICROKELVIN is working to integrate Europe's microkelvin facilities and place them at the disposal of the wider research community.

QUANTUM PHENOMENA ARE 'COOL'

A central aim of nanoscience experiments is to reach the regime where quantum phenomena begin to govern the behaviour of the system. This promises to allow new generations of properties and devices just as conventional microcircuits are running up against the physical limits of further miniaturisation. While quantum behaviour can be observed in very small samples at relatively high temperatures, it becomes much more apparent as the temperature is lowered.
The expense of microkelvin facilities has hitherto been a deterrent to conducting nanoscience experiments in this temperature realm. As such, the primary objective of the MICROKELVIN project is to open up existing European microkelvin facilities, developed for quantum fluids experiments, to allow experimental nanoscience to progress to this new temperature regime.

EXPANDING RESEARCHERS' ACCESS

A network of core and associated institutes will provide access, expertise and education for microkelvin nanoscience in Europe. As well as offering the low temperature facilities the consortium can also provide a microfabrication capability very closely positioned to the access facilities. It is envisaged that the access-giving facilities will yield a total of 20 months of visitor time per year for collaborating scientists.

MICROKELVIN's improved infrastructure will give the wider science community access to milli- and microkelvin facilities which will, in turn, foster the development of new techniques and materials to bring coherent structures into a completely new temperature regime.

The ultimate goal of the MICROKELVIN project is to create a virtual microkelvin 'laboratory without walls'. This will allow more researchers access to the information and data gathered at the consortium's facilities and advance research in electronics and quantum phenomena. Bringing together top researchers from across Europe will enable MICROKELVIN to pool existing research and knowledge and project it outwards by creating new stand-alone machines that can access the 'virtual laboratory' from anywhere. Such technology will increase commercial interest and benefit the field of microkelvin field as a whole.

SEVENTH FRAMEWORK PROGRAMME

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EU project officer: Maria Douka

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Partners:
Helsinki University of Technology (FI)
Centre National de la Recherche Scientifique, Grenoble (FR)
Lancaster University (UK)
Ruprecht-Karls-Universitaet Heidelberg (DE)
Royal Holloway and Bedford New College (UK)
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