

ADVANCED RESEARCH IN NANOTECHNOLOGY INFORMATION DEVICES AND NANO-ELECTRONICS: CONTRIBUTION OF EC PROGRAMMES IN IST

Patrick Van Hove

*European Commission, DG INFSO F1 Future and Emerging Technologies,
Office BU 33 3/43, B-1049 Brussels*

E-mail: patrick.van-hove@cec.eu.int

This communication presents a view of the ongoing work of the FP5 IST initiative on Nanotechnology Information Devices (NID), its take-up in the FP6 strategic objectives recently started on nanoelectronics and micro-nanotechnologies, the upcoming FP6 calls in emerging nanoelectronics and other related topics, and the prospects for future developments in the second part of FP6 and in FP7.

Following the successful FP4 Microelectronics Advanced Research Initiative (MELARI), heavily oriented towards semiconductor electronics, the NID activity aims to bring in new concepts from sciences beyond electronics and computing into multidisciplinary research towards new potential avenues for information processing. This action successfully attracted more than 30 projects contributing elements of from quantum mechanics, physics, chemistry, biology and nanomechanics to develop future visions of information processing systems. These projects have produced many research results to realise new types of nanometer scale **devices**, **architectures** and designs for information processing systems that are adequate for nano-scale implementation and tools and techniques for the **fabrication** of structures with critical dimensions below 10 nm. Cooperation among the various projects was greatly enhanced by the PHANTOMS network, co-ordinated by CMP Cientifica. PHANTOMS organised biannual NID workshops, technical working group meetings and links with industrial organisations. It published a number of newsletters and reports and assembled a large database of information on nanoelectronics. The NID members were also instrumental in establishing the NID Technology Roadmap for Nanoelectronics, a very important milestone paving the way for research beyond the Silicon-CMOS roadmap promoted by the industry-consensus International Technology Roadmap for Semiconductors (ITRS). The success of the NID roadmap can be seen in the adoption in the latest 2003 edition of the ITRS of the field and topics first promoted in the NID roadmap. This is now referred to as the "Emerging Research Devices" section of the ITRS. Another element of the success of the NID initiative is the much higher priority given in the EC Framework 6 to the areas of Nanoelectronics in Priority 2 (IST) and Nanotechnology in Priority 3 (NMP) of the Programme. This increased emphasis on nanotechnologies and nanoelectronics is also taking places in many other parts of the world such as the USA and Japan.

The first call for proposals for FP6 in IST generated very high interest and resulted in the support of projects with an estimated EC funding of about 1000 Million Euro, with major areas in nanoelectronics and lithography being supported through integrated projects and a network of excellence covering CMOS and lithography for the 45 nm node and below. Another set of projects was launched in the Microsystems and micro-nanosystems area; these target the diversification of electronics with polymer materials, microsystems and other devices, with particular interest for applications in health and ambient intelligence

systems. These new IST projects are also complemented by new projects in Priority 3 covering areas such as nanosciences, materials and nanofabrication.

The Commission expects to publish the 3rd IST call for proposals in the first half of June 2004. This call would include a set of 4 Future and Emerging Technology Initiatives already foreseen in the IST Workprogramme 2003-2004. Of particular interest are those covering “Emerging Nanoelectronics” and another on “Quantum Information Processing and Computing” (QIPC). Background information on these areas can be found through the Future and Emerging Technologies home page: <http://www.cordis.lu/ist/fet/home.html>.

A second part of the 3rd call is a joint IST-NMP call covering, among others, “Materials, Equipment and Processes for Production of Nano-Photonic and Nano-Electronic Devices”.

Proactive initiatives such as NID and “Emerging Nanoelectronics” are designed to create a critical mass of research on a given topic in Europe. They are hence addressing advanced topics, but that are at the same time sufficiently recognised to justify a substantial investment over 3-5 years. It is planned to implement the proactive initiatives of Call 3 through the new instruments only ([integrated projects](#) and [Networks of Excellence](#)), to integrate and strengthen European research. The activities that will emerge from this focused call are complemented by the FET-Open initiative, where STREPS can be submitted to address breakthrough or long-term research topics of a more risky nature. FET-Open also supports CA's and SSA's. The timing of the call for Emerging Nanoelectronics will allow the projects to start early 2005, thereby allowing a continuity with the NID projects started in 2001.

The second part of FP6 in IST is to be covered by a new Workprogramme 2005-2006. In Future and Emerging Technologies, we expect to continue offering the possibility to submit advanced research projects in upstream IST topics through the FET Open call, and to continue with focused calls for proactive initiatives. We are in the process of defining the initiatives that could be called for in that time frame, through consultation meetings and through web contributions; see <http://www.cordis.lu/ist/fet/id.htm>.

The EC has recently started the preparation of Framework Programme 7, and FET organised on 21-22 April 2004, a workshop intended to produce grand challenges for basic research in the second half of this decade. First results of the workshop will be presented.