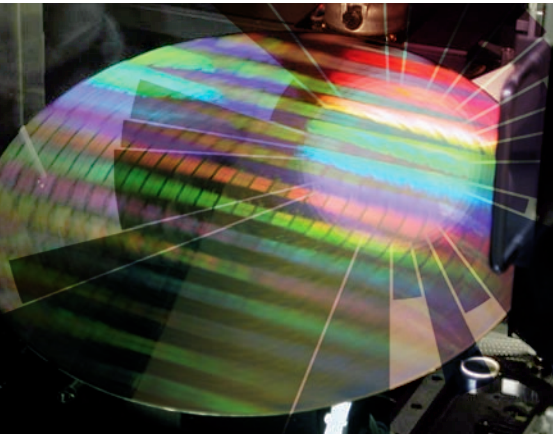


Project profile

EEMI450

European equipment and materials initiative for 450mm



Large-scale semiconductor fabrication is now standardised on 300mm diameter wafers. However, as demand grows and node dimensions diminish, major chipmakers are considering offsetting the growing costs of miniaturisation by increasing wafer size to 450mm to cut cost per produced die. A prerequisite is the availability of the required quality wafers and equipment able to handle larger wafers. The ENIAC JU project EEMI450 brings together the major European specialists to start such work to maintain and extend their leading role in the development and production of semiconductor equipment and materials.

Sub Programme

- Equipment and Materials for Nanoelectronics

Manufacturing costs per wafer are increasing with the advancements towards smaller node dimensions as per the semiconductor technology roadmap driven by Moore's law, referred to as 'More Moore'. Manufacturers of devices that meet mass-market demands, such as DRAM/Flash memory or microprocessors, are the first to follow this roadmap to reduce costs; technological benefits, such as higher speed and lower power consumption, provide additional reasons for the trend to ever smaller device geometries.

Severely increased costs per new node are expected from the 32nm half pitch onwards, because of increased processing complexity and the additional capital investments, especially in lithography, required to reduce dimensions.

Counteracting rising costs

Under the right conditions, the transition to 450mm diameter wafers will help counterbalance the rising manufacturing costs for future IC

nodes and so enable the economic progression assumed by Moore's law. The transition to larger wafers will support continued growth in the semiconductor industry. Lower costs will enable new products, open new markets and extend business to new cost-sensitive areas.

In addition, 450mm wafer size conversion represents an opportunity for more efficient use of resources. It opens the possibility to renew development efforts to reduce consumption of energy, water and other resources in semiconductor manufacturing while cutting environmental emissions per produced wafer area.

New level of co-operation

The main driver of the ENIAC JU project EEMI450 is the need for a new level of R&D co-operation for mastery of the 450mm challenge. EEMI450 brings together a network of important research institutes, major Europe-based semiconductor equipment and materials suppliers and a chipmaker as the major user.

Although each participating manufacturer has its own key process or metrology expertise defining its competitive edge, wafer handling, material and fabrication input/output aspects need to be addressed as a common effort, since synergies can be realised and common standards adopted. At the same time, generic aspects of wafer processing can be explored.

The is true for research into basic wafer characterisation and properties. Through these common efforts, EEMI450 expects to achieve considerable cost savings, better quality and shorter development cycles leading to final commercial products.

Range of expertise

The project addresses the complete spectrum of 450mm equipment and materials development, including wafer manufacture and characterisation, metrology, wafer handling, automation and development of process modules for batch and single wafer processing, as well as the equipment manufacturing supply chain. Naturally, only those metrology and process modules for which the respective partners possess key experience are addressed by this project.

EEMI450 has opted for short project duration to take the first steps into the new area, discuss basic concepts and standards, and produce the first 450mm wafers and, in some cases, prototypes and proofs of concept. Based on these initial steps, further efforts will certainly be needed to achieve viable production solutions. Consortium member Intel is a major driver of global 450mm activities

and will provide guidance on specifications, standards and concepts.

One goal is the applicability of new 450mm technologies to smaller wafer sizes. A requirement from the industry is the initial capability of 450mm equipment to process 300mm wafers as well. Consequently, a project advisory board has been established to provide guidance from the European perspective and to receive timely feedback on project results and the 'downgrade-ability' of 450mm developments.

The environmental aspect will also be taken into account as one of the objectives of the 450mm transition is that less energy will be used per processed wafer.

Broad European consensus

This ENIAC JU project is based on a European industrial initiative from semiconductor equipment and materials suppliers wishing to become active in 450mm wafer technologies. There is a broad consensus among such companies that they should not just sit on the sideline and watch what is happening, but that they should actively participate in these developments at an early stage to hold a competitive position.

The European semiconductor equipment and materials industry, including its supply chain, is a significant business sector, with a total turnover of €10 billion in 2009 and employing over 100 000 people. The success of EEMI450 is, therefore, vital to the growth of the manufacturing equipment and materials industry in Europe and to the expansion of employment opportunities in the sector.

Equipment and Materials for Nanoelectronics

Partners:

- AIS Automation Dresden
- Aixtron
- Alcatel Vacuum Technology France
- ASM International
- ASML Netherlands
- Bronkhorst High-Tech
- CEA-LETI
- EVGroup
- Fraunhofer IISB and IOF
- HAP
- IMEC
- Intel Ireland
- Ion Beam Services
- Mattson Thermal Products
- Nanophotonics
- Oxford Institutes Plasma Technology
- Physikalische-Technische Bundesanstalt
- PVA TePla
- RECIF Technologies
- Semilab
- SemiQuarz
- Siltronic
- SOITEC
- TNO
- Vistec Electron Beam
- Xycarb Ceramics

Project co-ordinator:

- Bas van Nooten, ASM International

Key project dates:

- Start: April 2010
- Finish: March 2013

Countries involved:

- Austria
- Belgium
- France
- Germany
- Hungary
- Ireland
- The Netherlands
- United Kingdom

Total budget:

- €18.3 million



The ENIAC Joint Undertaking, set up in February 2008, co-ordinates European nanoelectronics research activities through competitive calls for proposals. It takes public-private partnerships to the next level, bringing together the ENIAC member states, the European Commission and AENEAS, the association of R&D actors in this field, to foster growth and reinforce sustainable European competitiveness.