



**Coordination Action to enable an effective  
European 450 mm Equipment & Materials Network**

**Enable 450 Newsletter**

**Issue 4**

**July/August 2013**

## Enable450 Newsletter

Welcome to the fourth newsletter for the Enable450 project.

If you would like to supply information for publication, please contact the editor at [mbryant@futurehorizons.com](mailto:mbryant@futurehorizons.com).

Our website is now up to allow previous issues to be downloaded. Please distribute this document to anyone who might be interested and you may place it on your own intranet if you wish.

## Project Membership

There are eleven members of the Enable450 project consortium listed below.

ASM International NV (Coordinator)	ASM	Netherlands
Applied Materials Israel	AMIL	Israel
ASML Netherlands BV	ASML	Netherlands
Commissariat à l'énergie atomique et aux énergies alternatives	CEA-LETI	France
Fraunhofer IISB	IISB	Germany
Future Horizons	FH	UK
Intel Performance Learning Solutions (IPLS)	INTEL	Ireland
Interuniversitair Micro-Electronica Centrum vzw	IMEC	Belgium
RECIF Technologies	RECIF	France
SEMI Europe	SEMI	France
SOITEC	SOITEC	France

Project meetings are held on a three monthly basis and information fed to the EEMI450 consortium.

## European Funded 450mm Projects

An overview of each of these was given in the second edition of this newsletter. In the coming months we hope to publish details of progress where possible, recognizing that some information from these projects has to remain confidential for commercial reasons.

However we can give first details of a new project recently approved by the European Commission.

### Bridge450

Bridge450 is a new work program defined under the Objective FP7-ICT-2013-11. It is listed under Objective ICT-2013.3.1 Nanoelectronics and specifically Topic d: International Co-operation : One support action to develop a European strategy which addresses the challenges in manufacturing for 450 mm in dialogue with G450C and with the US, Korea and Taiwan.

The FP7 Coordination Action Enable450 began in 2012 to assist European 450mm programmes with data collection, standards, G450C liaison, dissemination of 450mm topics and other activities. The Bridge450 Support Action seeks to run in parallel with Enable450 to expand its scope with more focus on Asian semiconductor manufacture.

Bridge450 will support the European E&M companies and specially the SMEs to become aware of and understand Asian technical requirements and to develop solutions to address this market. To assist the information flow, a Semiconductor Manufacturers Board will be set up which is aimed to include representatives of Asian semiconductor IDMs and foundries.

A second objective of Bridge450 will be to establish the possibilities of 450mm semi-manufacturing in Europe and what would be needed to facilitate such an operation, which will be vital for the future of advanced nanoelectronics in Europe.

Thus this could be considered a sister project to Enable450 with many of the same companies involved as listed below.

<b>Participant no.</b>	<b>Participant organisation name</b>	<b>Part. Short name</b>	<b>Country</b>
1	ASM International NV (Coordinator)	ASM	Netherlands
2	Future Horizons Ltd	FH	United Kingdom
3	Interuniversitair Micro-Electronica Centrum vzw	IMEC	Belgium
4	Fraunhofer Gesellschaft zur Förderung der	IISB	Germany

	Angewandten Forschung E.V.		
5	Applied Materials Israel Ltd.	AMIL	Israel
6	RECIF Technologies	RECIF	France
7	Artemis Control AG	ART	Switzerland
8	SEMI Europe-Grenoble Office	SEMI	France
9	M+W Germany GmbH	M&W	Germany
10	AIS Automation Dresden GmbH	AIS	Germany

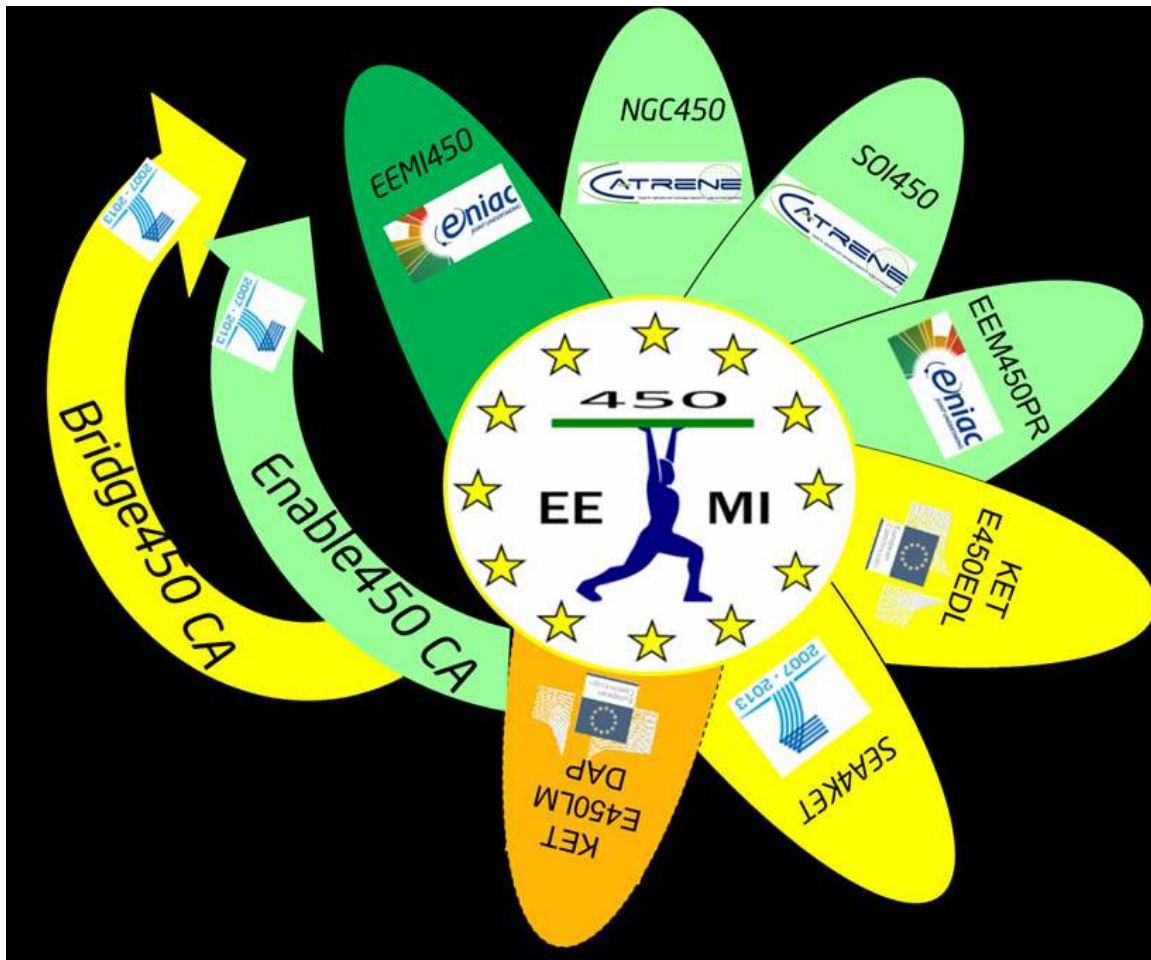
Ajit Manpcha, CEO of GlobalFoundries, recently stated that 85% of the cost of a new fab is spent on lithography. We can thus expect companies investigating building a 450mm fab to be in regular discussions with ASML who thus had no real need to be a member of this new project. However assuming a 450mm fab costs US\$10bn, there is still a large potential order for other companies. European SMEs are often in competition with suppliers from the US and Asia and it is essential that their existence is recognised by IDMs and foundries.

Bridge450 will attempt to research by visits to Asia and the US, what opportunities exist for European SMEs, whilst simultaneously presenting the abilities of European SMEs to the IDMs and foundries. Obviously if we discover that it is possible to source all requirements for a 450mm fab within Europe, this will also assist in promoting Europe as a suitable place for such a new fab to be constructed.

Officially the project begins on November 1<sup>st</sup>, but if you are a European based SME of any size with an interest in 450mm processing in any form whatsoever, please talk to Bas van Nooten or Mike Bryant at Semicon Europa this October.

Any company interested in taking part in future 450mm European projects is asked to first join EEMI450 whereupon they will be able to receive full details of new project proposals. The next meeting of EEMI450 will take place on the afternoon of Thursday 10<sup>th</sup> October at the Dresden Messe in the Messe Ballroom used for the 450mm sessions at SEMICON Europa. Members of the EEMI450 group do NOT need to be registered for SEMICON Europa to be able to access this meeting.

The current active and proposed projects are shown in this picture below.



## **Electronic Components and Systems for European Leadership (ECSEL)**

The new Electronic Components and Systems for European Leadership (ECSEL) Joint Technology Initiative (JTI) will operate under Horizon2020, the official name for the Eighth Framework Programme. It is a merger of the ARTEMIS embedded systems JTI and the ENIAC nanoelectronics JTI both set up in 2008 operating under FP7.

The new ECSEL JTI is expected to start in early 2014 and to be fully operational up to 2020 followed by a running down phase to 2024. It will bring together large companies, world class European research and technology organizations linked with higher education research labs, and SMEs providing technology and services. In particular three private industrial associations representing the actors from the areas of micro-/nanoelectronics, smart integrated systems and embedded/cyber-physical systems will be involved.

ECSEL will be managed by a dedicated Joint Undertaking whose Governing Board comprising private members (ARTEMISIA, AENEAS and EPoSS), Member States and the Commission, will take strategic decisions, whilst a Public Authorities Board consisting of representatives of the participating Member States and the European Commission will take funding decisions.

Thus future 450mm related early research projects will most likely be funded through this JTI, whilst CATRENE will continue pushing the results of this research towards commercialization until at least 2015.

Further details are available at :

[http://ec.europa.eu/research/press/2013/pdf/jti/ecsel\\_factsheet.pdf](http://ec.europa.eu/research/press/2013/pdf/jti/ecsel_factsheet.pdf)

## **G450C Industry Briefing**

A comprehensive overview of progress at G450C was given at SEMICON West in July. The presentation is available at :

[http://www.g450c.org/G450C-SemiconWest2013\\_IndustryBriefing.pdf](http://www.g450c.org/G450C-SemiconWest2013_IndustryBriefing.pdf)

Slide 38 details current work on Notchless wafers as highlighted in the last copy of this newsletter, stating that G450C believes 450mm notchless wafers are now technically achievable. Slide 41 details the timeline to achieve standardisation on this topic, with a ballot proposed by March 2014.

## 450mm Standards Update

James Amano of SEMI International Standards has published an update on the 450mm standards process at :

[http://www.semi.org/en/node/46506?goback=%2Egde\\_30219\\_member\\_265592419#%21](http://www.semi.org/en/node/46506?goback=%2Egde_30219_member_265592419#%21)

Since the submission of the first 450mm proposal in 2007, the SEMI Standards Program has developed over fifteen 450mm wafer-related standards, and work continues to ensure that critical framework is in place to support future high-volume manufacturing. The transition to 450mm manufacturing is accompanied by the development of various standards aimed at achieving cost, efficiency and technology improvements.

The most notable new proposal concerns development of a specification for a notchless 450mm wafer. Document 5604, Revision to SEMI M1-0413, Specification for Polished Single Crystal Silicon Wafer (Re: Addition of Notchless 450 mm Wafers). While a wafer notch is useful for alignment and orientation, there are impacts on yield and cost, with some estimating a loss of one to four dies per wafer. The existing SEMI M76-0710, Specification for Developmental 450 mm Diameter Polished Single Crystal Silicon Wafers, notes that a wafer notch impacts wafer symmetry, creating a stress area, and that while eliminating the notch would improve symmetry and stress issues, a new alignment method would be required.

Work is taking place in the Silicon Wafer Committee's International 450 mm Wafer Task Force, with the group focusing on replacing the notch with a fiducial mark scribed on the wafer. Items for consideration will include mark design, position, readability, speed, and impact on wafer integrity through the entire IC manufacturing process.

A related proposal calls for reducing wafer edge exclusion, the peripheral portion of a wafer where no viable device structure is possible. The current 450mm wafer specification (SEMI M76-0710), originally published in 2010, calls for a 2mm edge exclusion zone, but some device makers believe that this area can be further reduced, increasing yield.

Another new proposal is an effort to revise SEMI M1-0413, Specification for Polished Single Crystal Silicon Wafers (Doc. 5605), adding site flatness quality requirements (SFQR) for the 16 nm technology generation, including 450mm wafers.

In addition to these two new proposals, the Silicon Wafer Committee approved an update to SEMI M73-0309, Test Methods for Extracting Relevant Characteristics from Measured Wafer Edge Profiles to include 450 mm wafers, joining two other recently published new 450mm Standards:

SEMI E166-0513 - Specification for 450 mm Cluster Module Interface: Mechanical Interface and Transport Standard



SEMI G95-0613 - Mechanical Interface Specification for 450 mm Load Port for Tape Frame Cassettes in the Backend Process

More details of these standards updates will be discussed at SEMICON Europa.

## **SEMICON Europa: 450mm Conference**

As the semiconductor industry continues to make progress in preparing for the next wafer size transition, Europe has been proactive in engaging its Semiconductor Equipment and Materials Companies through the formation and efforts of the European Equipment and Materials Initiative for 450mm (EEMI450). However, in order to ensure this latest wafer size transition is facilitated in both an effective and efficient way, the need to collaborate and cooperate with other Consortia on a global scale is paramount, as the activities push closer towards production worthy toolsets and IDM pilot line activities. This 450mm conference will focus on European and Worldwide 450mm achievements, and how Consortia, OEMs and IDMs, with the help of Governments and funding agencies, are working together to achieve this challenging wafer size transition for the industry

### **AGENDA Wednesday, 9 October**

#### **Session 1: Worldwide Consortia Update:**

Chairman: Bernie Capraro, EU Research Programme Manager, Intel

14:00 Opening remarks

Lothar Pfitzner, Head of Department, Fraunhofer IISB

14:10 Leading the Industry Transition to 450MM wafers

Paul Farrar, General Manager G450C

14:30 The F450C Partnership within G450C: Program Overview and Key Activities

Peter Csatóry, Head of Group Global Technologies, M+W

14:50 EEMI450 and Global 450mm cooperation

Bas van Nooten, Director European cooperative program, EEMI450

15:10 'Metro450' - The Israeli Metrology consortium - 2nd year



Menachem Shoval, Chairman of Board, METRO450

15:30 Value Enhancement Through Global Collaboration

Steve Johnston, Director, External Programs and Technology Strategy, Intel

15:50 Overview and Activities of the Silicon Saxony 450mm Cluster

Jochen Kinauer, Director for Sales and Business Development, AIS Automation

## **Session 2: European Commission, Public Authority and funded project updates**

Chairman: Lothar Pfitzner, Head of Department, Fraunhofer IISB

16:40 Europe will continue to invest in 450mm

Khalil Rouhana, Director of Components and Systems, European Commission, DG Connect

17:00 JTI Implementing Aligned European/National/Regional Investment Policies in Nanoelectronics

Andreas Wild, Executive Director, ENIAC

17:20 Test Beds and Pilot Line will foster the development of the future 450 mm equipment

Denis Rousset, Technology Director, CATRENE

17:40 How Europe will succeed at 450mm

Malcolm Penn, President, Future Horizons

18:00 450 mm SOI substrates - A Development Status Update

Uwe Kriebisch, Product Manager, EV Group

18:20 450mm transition - From local initiatives to global cross collaboration

Alain Jarre, CEO, Recif Technologies

## **AGENDA Thursday, 10 October**

### **Session 3: The Role of the Research Institutes**

Chairman: Richard Oechsner, Senior Project Manager APC, FhG IISB

08:30 TBA

Lode Lauwers, Vice President, imec

08:50 How the TNO Contamination Control Program enables the 450 mm wafer size transition

Olaf Kievit, Project Manager, TNO

09:10 TBA

Markus Pfeffer, Group Manager, FhG IISB

09:30 The Interplay of Scaling and the Transition to 450mm at the College of Nanoscale Science and Engineering

Michael Liehr, CNSE Executive Vice President of Innovation and Technology, University at Albany

#### **Session 4: Status of 450mm Equipment and Materials**

Chairman: Guy Dubois, Founder and CEO, GDCL Management

10:20 ASMLs 450mm program progress: product strategy & technology

Frank Bornebroek, Product Management, ASML

10:40 Advanced FOUP Polymers

Jorgen Lundgren, Senior Field Applications Engineer, Entegris

11:00 Edge and Backside Defect Inspection and Classification for 450 mm wafer manufacturing

Michael Abraham, Managing Director, Rudolph

11:20 Requirements and solutions for 450mm equipment integration into factory systems

Thomas Dreyer, Director Research & Development, AIS

11:40 Scaling to 450 mm Wafer Size Requires Continuous Innovation in

Thermal Processing: Low-Temperature Plasma Oxidation

Juergen Niess, Director Technology, HQ-Dielectrics

12:00 TBA

Kirk Hasserjian, Corporate Vice President, AMAT

12:20 Closing comments

Lothar Pfitzner, Head of Department, Fraunhofer IISB

Abstracts and biographies of all the speakers are available at :

<http://www.semiconeuropa.org/node/2216/>

## **Intel Begins Construction of the World's First 450mm Semiconductor Manufacturing Facility.**

Intel Corp has confirmed the beginning of construction of the fab D1X module 2 in Hillboro, Oregon. This will be the world's first semiconductor manufacturing factory processing 450mm wafers and will be used primarily for development purposes and lead to full production 450mm fabs in locations still to be announced.

Stacy Smith, the chief financial officer of Intel, stated "We will spend roughly \$2 billion to start building our first 450mm development facility in 2013. When we look at 2015 as the time when we can have equipment available, we want to start construction of a big development facility. Construction is typically a couple of year's cycle."

D1X module 2 is about the same size (1.1 million square feet, 106.1 thousand square metres) as the original fab D1X and is built specifically for 450mm wafers. Obviously this makes it considerably larger than the Imec 450mm cleanroom also in construction but this fab will be used to debug Intel's complete 450mm manufacturing process as soon as the appropriate manufacturing tools are available.

## **Picosun Oy Introduces Large Scale Batch ALD Reactor Capable of Processing 450mm Wafers**

Picosun Oy, a European Atomic Layer Deposition (ALD) equipment manufacturer, has launched its PICOSUN™ P-1000 ultra-large scale batch ALD tool, the latest addition to the fully automated, high throughput PICOSUN™ P-series ALD reactors. The P-series ALD tools provide production-proven and cost-efficient ALD solutions to industrial manufacturers.

The PICOSUN P-1000 batch ALD reactor's deposition chamber can be made according to the customer's specified substrate size. As square, the maximum cross section of the chamber is 470mm x 470mm, and as circular, the maximum diameter is 600mm. The maximum height of the chamber is 700mm. The square chamber is optimal for coating batches of 450mm diameter silicon wafers.

<http://www.picosun.com/sitenews/view/-/nid/108/ngid/4>