Coordination Action to enable an effective

European 450 mm Equipment & Materials Network

Enable 450 Newsletter

Issue 6 **January 2014**

Enable450 Newsletter

Welcome to the sixth newsletter for the Enable450 project.

If you would like to supply information for publication, please contact the editor at 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.

As a first item I would like to invite those interested in 450mm technology to attend the following event free of charge :

The Bridge450 Initiative First Workshop :

The 450mm Wafer Size Transition -

Opportunities for Europe

7 Feb 2014

Time: 09:30-15:30

Location: Imec, Leuven, Belgium

Proposed and supported by BRIDGE450 partners

Organized by Future Horizons, imec, SEMI Europe Grenoble Office

Almost a billion Euros of investment in Europe combined with the G450C initiative based in Albany New York is making the 450mm wafer size transition a reality. It is forecast that by around 2026 usage of this wafer size will equal that of 300mm. This transition will inevitably lead to many opportunities for the European Semiconductor E&M community, both in the building of new 450mm fabs and also in improvements to existing 300mm fabs derived from the same new technologies and techniques.

This workshop is hosted by IMEC and will explain the current status of the transition and will emphasize the actions being taken by the European Commission under the FP7 Bridge450 program to ensure European SMEs can be fully involved in this transition. It will also cover progress on the IMEC 450mm Pilot Line and give updates on the market. Questions will be taken at the end of each presentation.

Posters giving details and latest news from all the European funded 450mm projects will also be on display.

REGISTRATION

Free of charge but compulsory.

Please send an email to Veroni.Ballet@imec.be and refer to the BRIDGE450 Workshop.

Capacity is limited, 1st booked, 1st served.

VENUE

Imec, Kapeldreef 75, 3001 Leuven, Belgium

PROGRAM

09:30	Registration - Networking Coffee
10:15	Welcome Yann Guillou, Business Development Manager, SEMI Europe Grenoble Veroni Ballet, Project Coordinator, imec

10:30	Introducing the Bridge450 Initiative Mike Bryant, CTO, Future Horizons
11:15	450mm Collaborations – A Viewpoint From an SME Alain Jarre, CEO, Recif Technologies
12:00	Networking Lunch
13:00	IMEC 450mm Pilot Line and Related Technologies Hans Lebon, sVP Fab and Process Step Development, imec
13:50	Update of the SMART2010/062 Report on 450mm Manufacturing Malcom Penn, CEO, Future Horizons
14:40	EEMI450 Update and Wrap-up Bas van Nooten, Consultant and Spokeman EEMI450, Semi Consulting
15:10	Coffee and Networking. Speakers and Bridge450 partners will be available for discussions

About BRIDGE450

Bridge450 is a work program defined under the Objective FP7-ICT-2013-11 "An 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." It is effectively a

sister project to Enable450 and shares many of the same resources, but its members are mostly SMEs on whom the project focuses.

The members of this program are ASM International NV (Coordinator), Future Horizons, Interuniversitair Micro-Electronica Centrum vzw, Fraunhofer Gesellschaft zur Förderung der Angewandten Forschung E.V., Applied Materials Israel Ltd., RECIF Technologies, Artemis Control AG, SEMI Europe, M+W Germany GmbH and AIS Automation Dresden GmbH.

European Conferences

Since the last newsletter there has been only one major conference in Europe of which details are given below. There are also two upcoming ones listed.

European Nanoelectronics Forum

This took place on November 27th and 28th in Barcelona consisting of one and a half days of presentations and an attached poster and demonstration area.

The author of this newsletter attended together with almost 400 others from the industry and academia. I found the presentations were of interest but felt that the poster area was a little disappointing with quite a lot of project areas unmanned for the whole event meaning one could not ask questions of these projects. Even more disappointing to myself was that the 450mm projects were only assigned a small area in the corner of the room and given no presentation time. More than Moore projects are of course important to Europe but 450mm projects form one of the largest groupings within European Nanoelectronics research with almost a billion Euros of investment and I expected them to be better represented at this conference. Behind the scenes there was some 450mm related activity with the Enable450 Advisory Board meeting and other discussions, but still no hint from the European Commission of any attempt to compete with the Marcy initiative from New York State.

ISS Europe 2014

This SEMI Europe event will take place in Salzburg Austria from February 23rd to 25th. C level representatives of all the top European companies will be in attendance, many making presentations on their views on the industry's future in Europe and elsewhere.

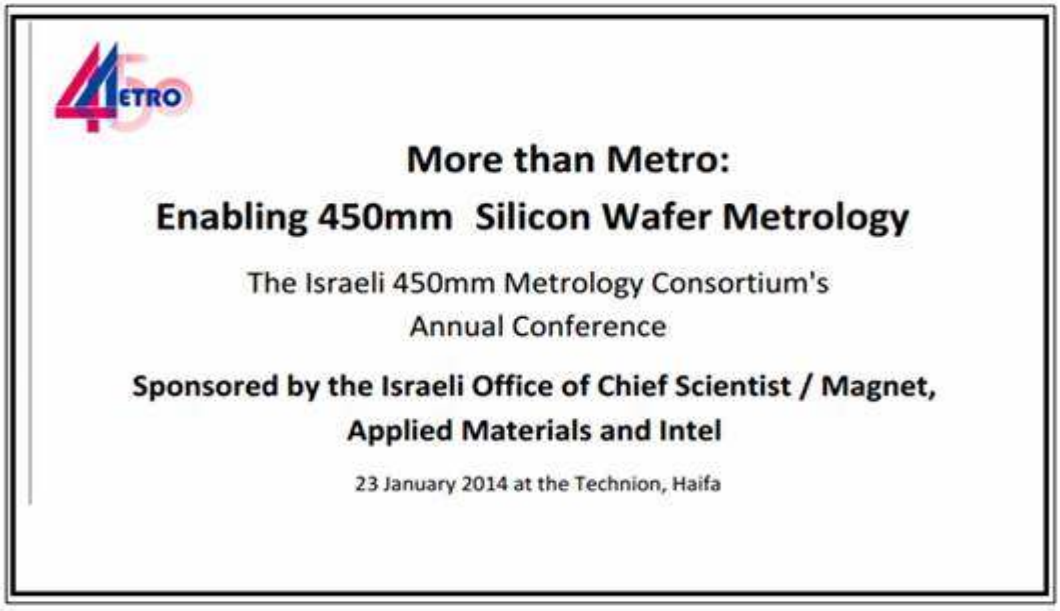
http://www.semi.org/eu/EventsTradeshows/p035572

METRO450 Conference

The annual 450Metro conference is the largest gathering of Israeli-based metrology companies. Attendees include members from Intel, Applied Materials, Jordan Valley, Nova, Nanomotion and others. Top researchers in many areas of interest to 450mm metrology will present their findings.

It will be held at the Technion institute, Haifa, Israel on January 23rd. The agenda and registration are available at

http://www.metro450.org.il/year2conference



SEMICON Japan 450mm Executive Forum

The 450mm Executive Forum was organized as part of SEMICON Japan by SEMI and held in Chiba Japan on December 5th. This was extremely well attended with standing room only most of the time.

There were five sessions dealing partly or exclusively with 450mm, these being :

- 450mm Executive Forum - 450mm Transition Update

  Speakers were Paul Farrar of G450C, Roger De Keersmaecker of Imec, Kazuo Ushida of Nikon and Akihisa Sekiguchi of TEL.

  http://www.semiconjapan.org/en/sessions/STheater5

- G450C Industry Briefing
- ITRS Briefing Seminar

  Speakers were Paolo Gargini, Chairman of the ITRS and Hidemi Ishiuchi of Toshiba Corporation. http://www.semiconjapan.org/en/sessions/STheater8

- 450mm Manufacturing EHS and Facilities Seminar

  Speakers were Frank Robertson of G450C, Allen Ware of M&W and Hisato Tanaka of TEL. http://www.semiconjapan.org/en/sessions/ehs1

- SEMI EHS Standards Workshop - EHS Challenges for 450mm
- 450mm Transition Status with SEMI Standardizaton View - Notch Less System Consideration Started! http://www.semiconjapan.org/en/sessions/std3

There is an overview of the event at http://www.semi.org/en/node/48501

Update on 450mm SEMI Standards

Solid State Technology magazine published a detailed update on the statue of 450mm standards recently. This includes links to every SEMI 450mm standard and documents, and the three committees that develop and support these standards.

http://electroiq.com/blog/2013/11/update-on-450mm-semi-standards/

The new standards are :

- 450mm Polished Single Crystal Silicon Wafer Specification
- Front Opening Shipping Box (FOSB) Standards
- Assembly and Packaging Standards
- Guide to SEMI Standard for 450mm Wafers (Auxiliary Information)

Useful Data on 450mm Takeup

If you are looking for useful predictions to justify a 450mm project then you might find the following White Paper "Forecasting the 450mm Ramp Up" from ICKnowledge.

http://www.icknowledge.com/news/Forecasting%20the%20450mm%20Ramp%20Up.pdf

Obviously the data given is at best a prediction and possibly a little optimistic, but it does give a useful starting point.

European Funded 450mm Projects

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.

An overview of the projects to date were given in the previous editions of this newsletter.

ECSEL First Pre-Brokerage Event

ECSEL is the new Joint Technology Initiative (JTI) on Electronic Components and Systems for European Leadership. It is a merger of the ARTEMIS embedded systems JTI and the ENIAC nanoelectronics JTI set up in 2008, together with the European Technology Platform EPOSS (Smart Systems Integration.

ECSEL 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 organisations linked to higher education research labs, and SMEs providing technology and services.

The first pre-brokerage event since the formation of the ECSEL JTI will take place at the Crowne Plaza in Brussels from February 4th to 5th. The corresponding CATRENE brokerage event will take place in the same venue from February 5th to 6th. However to date only details for the Artemis part of ECSEL have been released so I would suggest one obtains more details but before deciding to attend, but assuming the ENIAC part is included any company interested in taking part in future 450mm European projects should probably attend to make their interest known to the key players.

Enable450 First Year Review

The eleven members of the Enable450 project consortium are 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

This project, of which this newsletter is one part, recently completed its first year and has published the first year report which is summarized here.

A good start was made in collecting information concerning 450mm requirements as defined in the project description. The following sources were used to collect these requirements:

- Results from previous EU studies on 450mm and 450mm European project results
- Worldwide activities, especially those at CNSE/G450C, Albany, NY and its publications
- Worldwide roadmaps (ITRS,...)
- Literature (in future we aim to summarize all newly available literature on 450mm technology in this newsletter)

- Media (SEMI, respective magazines, like EEtimes, Solid State Technology, Elektroniknet,
- Bits & Chips and other semiconductor related publications
- Results that became available through the marketing organisations of the participants.

The objective is to bring together the requirements in a database, to be hosted by FhG IISB. In this first year literature studies were done and a start was made with the collection of the requirements, however the database is not yet installed but will be implemented in Q1/14.

We have identified all technical committees and task forces involved in 450mm standardization throughout the world and talked to the respective leaders of these technical committees and task forces. The main entry point in the SEMI International organization was identified for each region. Available standards have been communicated to the interested parties and the Newsletters.

Main standards of interest have been:

Mechanical cluster interface.

This standard had already been proposed during the ENIAC EEM450 project and was followed up, mainly by partner RECIF.

Notchless wafer.

Many discussions have been held globally to find a consensus about the 450mm configuration. Originally a notch was proposed in SEMI standard M1-1013. However pressure from industry to reduce the so-called exclusion zone at the edge of the wafer from the 2mm used on 300mm wafers to 1.5 or even 1mm resulted in another look at the notch and its influence on process non-uniformities. Currently so-called Fiducial Marks on the wafer backside are under evaluation by G450C, to verify wafer alignment can be accomplished without the notch. This was also evaluated but not adopted for 300mm over a decade and a half ago but optical alignment technology has moved on considerably since then. Again RECIF was the main partner of Enable450 involved in this technical assessment with G450C. They provided the feedback on the first batch in Q4 2103 and will do the same for a second batch in Q1 2104.

Metrology.

The goal here is to improve throughput of metrology tools for the larger wafer plus the smaller dimensions called for in the ITRS roadmap. New standards will also have to be developed concerning alignment marks.

Dissemination efforts have been supported by issuing bi-monthly Newsletters with a wide global distribution of more than 4000 recipients including the EEMI450 community. Back issues are available on the project website www.enable450.eu. During the first project year 5 newsletters were issued, the last being in October 2013.

The 5th annual 450mm 450mm Conference during Semicon Europe 2013 was supported well with several participants of this project among the 22 speakers participating across a 2 day agenda. Further efforts to engage Asia in the global activities were explored, with EEMI450 participation in the EU-Taiwan ICT Technical Cooperation Conference held in Taipei during March 2013.

During the year the Enable450 project partners have also participated in and/or presented at the following occasions: European Nanoelectronics Forum 2012, AENEAS-Catrene brokerage meeting 2013, Strategical Conference of EU-Taiwan ICT Technical Cooperation, EEMI450 General Assemblies, ITRS Spring Meeting, Dutch Hightech Systems 2013 Show, Night of Knowledge during Semicon Europe, 450mm Conference during Semicon Europe, METRO450 presentations in Israel.

Enable450 partners are also involved in the following European 450mm related projects, providing an excellent connection to these projects and consortia: NGC450, SOI450, EEM450PR, E450EDL and E450LMDAP, plus the Israel METRO450 project.

Throughout the first year of Enable450, the Link to Global Activities has been very active in establishing areas for cooperation and complementary function with G450C in Albany, NY, USA. Six specific activities have been identified including 450mm test wafer supply, microcontamination investigation, metrology aspects, Equipment Performance, Metrics and Demonstration Test Methods for pre-competitive development together.

Stronger links with the relevant ITRS Working Groups will be sought during Year 2 of the Coordinated Action, building upon the EEMI450 report out during the 2013 Spring Meeting in Europe.

The Enable450 consortium has been active in cooperation with the Steering Committee of EEMI450 to support the submission of a new FP7 Support Action proposal called Bridge450, which was granted. This new project Bridge450 will enhance Enable450 in emphasising the link with 450mm activities in Asia. In the next project year common activities such as workshops are already being planned.

10/100/20

One of the first initiatives under Horizon 2020 is the 10/100/20 initiative announced by Neelie Kroes earlier this year. This aims to achieve 20% of world semiconductor production within Europe by 2020. As a first step towards this the European Leaders Group held several meetings in Brussels in the latter part of 2013. Their report was originally expected to be published on December 16th but has now delayed until early February to allow the document to be fleshed out in more detail.

Members of the ELG are :

- Ben Verwaayen, formerly of BT and Alcatel
- Carlo Bozotti of STM
- Reinhard Ploss of Infineon
- Rutger Wijburg of Globalfoundries
- Rick Clemmer of NXP
- Hubert Lakner of Fraunhofer
- Mike Muller of ARM
- Peter Wennink of ASML
- André-Jacques Auberton-Hervé of SOITEC
- Luc van den Hove of Imec
- Jean Therme of CEA
- Eamonn Sinnott of Intel

Editorial Comment

From Mike Bryant, editor of this newsletter.

For most of 2013, 450mm technology dropped off the radar of the technical press whilst companies belonging to G450C, EEMI450 and METRO450 got on with actual development, whilst Intel and Imec proceeded with design and construction of their 450mm pilot lines.

However in the past month there has been more mention of this technology again. Most of it has derived from an article by Bits&Chips http://www.bits-chips.nl/artikel/asml-zet-450-mm-ontwikkeling-op-laag-pitje.html but has since been embellished by the thoughts of others.

A quick summary of the article is that ASML is reducing its 450mm development efforts and will "run" again once it receives the green light from its customers.

However some press and bloggers, and even senior management at certain semiconductor companies, appear to have concluded this in some way marks the end of the 450mm rollout before it has even begun and have been saying so publicly. This in turn has led to confusion in some of the top semiconductor manufacturers outside of Intel, TSMC and Samsung as these companies are currently beginning to formulate their own 450mm plans for the end of this decade.

Now obviously ASML is a very active participant in European 450mm R&D projects which are continuing so although they may be ahead of expectations we are sure they will continue R&D at the planned rate. It was always expected that full production of systems would only begin once real orders are received so any delay or otherwise is out of their hands. In fact since the preparation of the SMART2010/62 by Future Horizons for the European Commission the identified slippage to date from our predicted schedule has been less than 9 months. This report also stated that 8nm would be the first process on 450mm production wafers after proving on 300mm first and there was never any expectation that the 10nm node would be introduced on the larger wafer size as the SemiAccurate newsletter has been stating.

Of course the EUV development programme will be unaffected by this statement as there is no way this cannot be termed a bottleneck either to 300mm or 450mm processing but steady progress is known to be being made by ASML and Imec towards the project goals.

Many of us were around for the last wafer transition to 300mm and remember this had a very damaging false start at a larger node which cost the semiconductor equipment manufacturers a lot of investment before the eventual introduction at 90nm, and we certainly don't want to see the same happen again on 450mm wafers. However it should be remembered that semiconductor processing is never a fixed target and the 300mm equipment being installed now differs massively from that installed in 2001. Moreover much of the equipment needed for 10nm fabs will require significant upgrading from current equipment, as will the purity of wafers and materials used, whilst metrology is taking a huge leap forward from something 'tacked on the end' to being an integral part of the semiconductor processing chain.

The fact is that if the 450mm projects were not happening then equivalent projects for '300mm Prime' would need to be taking place to develop exactly the same new equipment and materials but on the old wafer size. In fact we are already seeing technologies and techniques developed for 450mm named projects being fitted to 300mm wafer processing products and this is a trend that will continue.

Another issue is that existing 300mm fabs are neither energy nor materials efficient and the 450mm transition is seen as an opportunity to improve matters with 'green' processes. It is to be hoped that these techniques can be retrofitted to most if not all 300mm fabs as well.

In conclusion I do not think the comments about ASML in the press or the lack of recent comments by most semiconductor manufacturers mark anything sinister as the cost advantages of 450mm over 300mm wafer processing are too much to simply ignore. But even in a hypothetical worst case where the 450mm rollout did not proceed then the work performed to date in Europe on the numerous '450' projects and by the G450C would by no means be wasted.

Finally let's all work for a Happy and Prosperous New Year for the European Semiconductor industry.

Mike Bryant