



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

Enable 450 Newsletter

Issue 7

April 2014

Enable450 Newsletter

Welcome to the seventh 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.

<http://www.enable450.eu/index.html>

Please distribute this document to anyone who might be interested and you may place it on your own intranet if you wish.

Editorial

The industry has recently been full of so many stories and rumours concerning 450mm technology that we at Future Horizons are now regularly receiving e-mails simply asking for our opinions or some actual facts. Unfortunately the key companies involved are not responding to questions so we are unable to expand as much as we would like,

However we believe the ongoing delays with EUV processing and the recent improvements to the speed of ArF lithography means that the latter is now the most likely full production launch lithography for 450mm technology. This may not actually be a major problem though if the launch product is a 3D Flash memory as this uses larger geometry sizes and doesn't require multiple patterning.

In any case despite all the stories and speculation, actual progress and good news is being made on 450mm technology. In Europe RECIF delivered the first EFEM to Imec whilst Nikon announced their first 450mm litho machine will begin producing wafers in June. Other progress at G450C on equipment delivered there is progressing well. Meanwhile the co-operation between G450C, EEMI450 and METRO450 is now very healthy.

RECIF Delivers First 450mm EFEM To Imec

As part of the NGC450 and EEM450PR projects, RECIF has delivered their first 450mm EFEM (Equipment Front End Module) to Imec. Primarily, it will be used as a wafer lot sorter supporting MES connection, wafer alignment and ID reading.

This is now installed in Imec's 300mm cleanroom but will move to the 450mm cleanroom once that new build is complete.

The characterization phase has started in April 2014.




Nikon announce first 450mm immersion photolithography tool

Nikon Corporation announced that the world's first 450mm immersion photolithography tool will begin patterning and delivery of wafers in June of 2014 in support of the Global 450mm Consortium (G450C).



Using a laser from Gigaphoton, this critical milestone will enable G450C founding members and CNSE to perform 10 nanometer and smaller size photolithography on full silicon wafers, while optimizing tool configuration and performance. Upon completion of optimization, the Nikon Corporation tool will be delivered to CNSE in April of 2015 where it will join existing 450mm infrastructure.

Performance evaluations show the tools currently on site at CNSE are exceeding expectations in capability, process uniformity, and defect levels. Additionally, two sources have been established for supplying 450mm wafers to the G450C.

Nikon 450 mm Program



- Customer orders in place



- Advanced litho patterning enabled for G450C in 2014
- 450 mm immersion scanner at Albany in early 2015
- Production tools timed with the market requirements

450 mm innovations will achieve productivity and accuracy requirements

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The Bridge450 Initiative First Workshop :
The 450mm Wafer Size Transition -
Opportunities for Europe

This took place on February 7th 2014 with presentations from Mike Bryant of Future Horizons, Alain Jarre of Recif Technologies, Hans Lebon of Imec, Malcolm Penn of Future Horizons and Bas van Nooten of Semi Consulting.

Of particular interest, Hans Lebon outlined the concept and timescales for the Imec 450mm pilot line fab.

The presentations are all available at

http://www.enable450.eu/events_bridge450.html

A review of the event by Dick Selwood entitled “Which Will be the First Penguin in the Water ?” is available at

<http://www.eejournal.com/archives/articles/20140227-450mmwafers/>

Another review of the event by Rania Georgoutsakou entitled “Europe Taking its Expertise in 450mm Equipment and Materials Manufacturing to Asia and the U.S.” is available at

<http://www.semi.org/en/node/49031?id=sgueu0314>

Bridge450 US and Asian Presentations

As mentioned in these presentations and articles, members of the Bridge450 team will soon be presenting Europe's semiconductor equipment industry abilities in both 450mm and advanced 300mm wafer processing to companies in the US and Asia,

If you wish to have your company details included in this please fill in the slide available at the following URL as soon as possible and send it to the special e-mail address provided.

<http://www.enable450.eu/450Toolbox.html>

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.

European Conferences

EEMI450 11th General Assembly 2014

This event was held at Imec on March 28th with most members of EEMI450 attending. The agenda covered the following subjects :

Global 450mm metrology update.

Introduction to and comments about the report of the ELG (Electronics Leaders group) to the Commission.

International 450mm update.

Update on the progress of the NGC450 project.

Activities within the Enable450 and Bridge450 projects.

Discussion about your future expectations concerning EEMI450.

Any European company interested in attending future meetings should first contact Bas van Nooten bas.van.nooten@semiconsulting.eu to join the EEMI450 initiative.

SEMICON Europa 2014

This SEMI Europe event will take place in Grenoble from October 7th to 9th. This will include a two day session on 450mm wafers entitled “450mm Innovations and Synergies for Smaller Diameters”. If you are interested in making a presentation you should submit an extract as detailed here :

http://www.semiconeuropa.org/sites/semiconeuropa.org/files/docs/SCEU14_STC%20450_Call%20for%20Papers-140220.pdf

ISS Europe 2014

This SEMI Europe event took place in Salzburg Austria from February 23rd to 25th.

C level representatives of all the top European companies were in attendance, many making presentations on their views on the industry’s future in Europe and elsewhere. Currently access to these is for attendees only but some of these may appear on the SEMI website in the coming months.

Metro450 Conference 2014

The second annual Metro450 conference took place on January 23rd at the Technion, Israel. Metro450 is an Israel-based consortium with the goal of helping the metrology companies advance in their fields. The consortium's members include metrology and related companies, as well as academics who support these companies by performing basic research.

The conference was sponsored by the Israeli Chief Scientist Office, by Applied Materials Israel and by Intel. There were several goals for the conference: to provide an opportunity for industry leaders as well as academicians to meet and discuss the latest developments in the world of metrology, to present these advances to audiences which would normally not be privy to such information, and to learn more about the international effort in 450mm wafer technology.

Over 200 people attended this conference from Israeli companies and academia, as well as from Europe and the United States. Israeli companies included Applied Materials, Jordan Valley, Nova, KLA, Zeiss Israel, and others. Academic members included researchers from the leading Israeli universities, including the Technion, Tel-Aviv U. and Haifa U. European companies were represented by ENIAC, as well as large corporations such as ASML as well SME-based companies. The G450C consortium, based in Albany, N.Y. was also well represented at this conference.

Some of the highlights of the conference included scientific discussions of different metrology methods, and their adjunct requirements, such as improved rapid wafer movement, improved sampling methods and fast computing.

Presentations also included an overview of the advances necessary to move the industry forward, optical CD metrology, x-ray metrology, and novel piezo-based wafer movement. A panel discussed various broad industry trends, including the timeline of 450mm wafers, European programs and the Israeli programs.

International speakers discussed the European technology model, risk mitigation of 450 through collaborations, 450 collaborative projects under ENIAC, 450mm wafer movement challenges and metrology challenges beyond 14nm.

The conference was described by attendees as very successful. It provided an excellent opportunity for metrology leaders from around the world to discuss directions of the industry, an opportunity to learn more about the challenges as well as novel ideas for leading the metrology world to the future.

Additional information about the conference and the Metro450 consortium can be found at: <http://www.metro450.org.il/>

Designing With Uncertainty

This workshop took place in Sheffield, England from the 17th to 19th March. Although not targeted at a particular wafer size, The key theme of the workshop was how to deal with the higher logical error rates likely to be encountered at smaller nodes and presentations were given on both on the variance of semiconductors at nodes down to 7nm, on memory architectures to overcome the SRAM noise margin problem, and on the various techniques available to detect and correct logic errors.

Some applications suitable for nodes far smaller than current technologies were also discussed, notably a million core ARM processor designed to work like the human brain.

The general impression was that if Moore's Law begins to die it won't be due to circuit problems and that there are many nodes left in which 450mm wafers can be introduced provided the economics of doing so makes them viable. .

News

Alignment on 450mm Tool Testing

The G450C and EEMI450 have in future agreed to work together on all aspects of tool testing which it is hoped will accelerate acceptance of new tools into the process flow.



Alignment on 450mm Tool Testing



- In the spirit of global coordination, EEMI450 participants the Fraunhofer Institute, IMEC and Metro450 have agreed with G450C to align on using the G450C Demonstration Test Methods as the means of characterizing 450mm equipment
- By standardizing on the same approaches to testing, common data collection tools and report content outlines, the outputs of such testing will have the same scope, consistent format and comparable data regardless of where the work is done and Suppliers will not have to accommodate multiple testing regimes
- This alignment enables the organizations to exchange reports in a complementary fashion, asking the Suppliers to perform only one such demonstration per tool and increasing the information flow to the members of each program
- This collaborative effort provides value to all stakeholders by moving the 450mm transition forward in a cost-effective and timely manner

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“No technical barriers seen for 450mm”

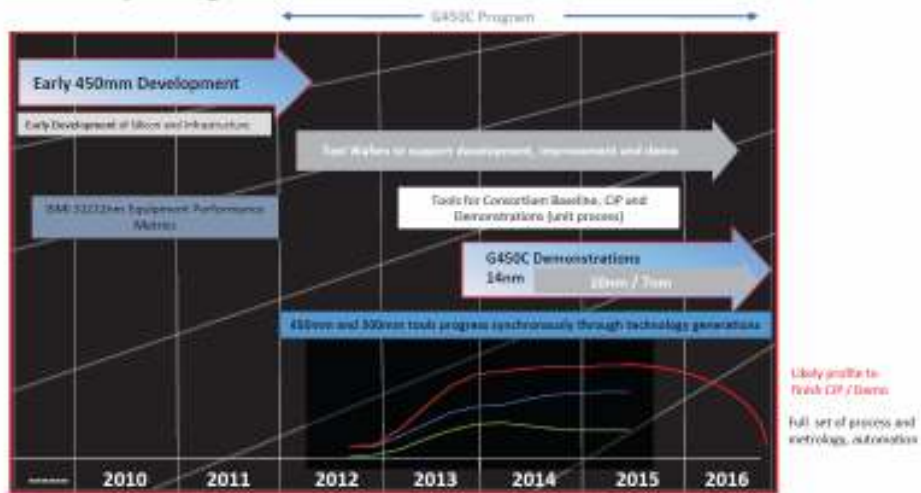
This article gives an informative interview with Paul Farrar of G450C. Details of all the steps in wafer fabrication is give in great detail and is definitely of interest to anyone interested in 450mm or advanced 300mm wafer fabrication.

<http://electroiq.com/petes-posts/2014/02/19/no-technical-barriers-seen-for-450mm/>

In addition to this presentation, the current planned timescales for G450C are shown in the following slide.



Development and Technology Intercept Targets



Notchless Wafer Evaluation

RECIF has been undertaken an evaluation of notchless wafers and completed this in February 2014. They found no technical show stoppers but there are some IP issues to be clarified,

This issue will go to ballot in June or July 2014.

RECIF has also initiated a new area of G450C – EEMI450 cross-collaboration by beginning the writing of the first DTM (Demonstration Test. Method).

“450mm Delayed and Other SPIE News”

On a more negative note, Scotten Jones of IC Knowledge wrote a report on the SPIE Advanced Technology Conference entitled “450mm Delayed and Other SPIE News”.

<http://www.semiwiki.com/forum/content/3241-intel-450mm-delayed-until-2023.html>

I think this is worth a read but we probably need to wait to hear official responses over the coming months before getting too concerned. However in the meantime the G450C have issued the following slide to clarify their current situation.

G450C Messages to EEMI450 General Assembly



- Some IC Maker 450mm timelines have softened and the program now has more time vs. prior plan to demo first tools as soon as possible
- G450C has developed a new demonstration model and timeline, with demo testing extending through 2016
 - Equipment Performance Metrics will be refreshed with global input to reflect more advanced technology targets for sub-10nm
 - Baseline characterization on early tools will focus on process capability for test wafer support and enabling technology progression that can also benefit 300mm capability
 - G450C will work with Suppliers on continuous improvement and development of platforms meeting HVM productivity scalars
 - The resource-intensive marathon portion of the demos will be deferred to when the tools are at customer-ready configuration / capability
- G450C continues to collaborate globally to make the 450mm wafer size transition both efficient and effective

March 2014

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 have been meeting and released their first report on February 2014. The document is available at :

<http://www.semi.org/eu/sites/semi.org/files/docs/AEuropeanIndustrialStrategicRoadmapforMicro-andNano-ElectronicComponentsandSystems.pdf>

Mike Bryant of Future Horizons gave a brief presentation at the latest EEMI450 General Assembly highlighting the good points and the occasional error in the report. He outlined that Europe will need around 29 new fab modules by 2020 or as many as 36 by 2025 to meet the aggressive targets of this initiative.

His presentation is available on the Enable450 website at :

www.enable450.eu/

SOKUDO DUO 450mm coat/develop track system at G450C

Dainippon Screen Mfg's subsidiary company's SOKUDO DUO will deliver a 450mm coat/develop track system to G450C in the summer of 2014, to be used for immersion ArF lithography and Directed Self-Assembly (DSA) applications. The SOKUDO DUO will be added to Dainippon Screen's suite of 450mm cleaning equipment in CNSE's NanoFab Xtension. Dainippon Screen's 450mm wafer scrubber, single wafer cleaning, as well as millisecond annealing system will be among the equipment set to be available for the G450C.

Gigaphoton Light Source for G450C

Gigaphoton has announced it will provide G450C with an advanced high-power GT64A laser for development and demonstration of high-volume-production 450mm lithography scanners. The laser will be used for both off-site and on-site development and testing, as well as technology demonstrations at CNSE's G450C facility. Delivery of the laser to CNSE is expected in April 2015.

The GT64A can achieve a power output of up to 120W for multi-patterning in 450mm wafer production applications. It incorporates a highly stable energy, spectral bandwidth, wavelength, and beam profile, combined with greatly improved overlay accuracy, critical dimension control, and minimization of line-edge roughness. Furthermore, the GT64A's product concept minimizes the consumption and cost of electricity, gas, and cooling (facilities) resources.

Rigaku TXRF 450mm Spectrometer

Rigaku Corporation, has announced its TXRF-V450 Total-reflection X-Ray Fluorescence Spectrometer has been selected by a global Semiconductor Equipment Manufacturer for contamination measurement on 450mm diameter Silicon Wafers.

2013 Intel Special Recognition to Bas van Nooten

Intel Ireland recently made a special presentation at the Intel Ireland Research Conference in Clontarf Castle, Dublin to Bas van Nooten to mark his Leadership of the European Equipment and Materials 450mm Initiative, EEMI450.

The presentation included a special 450mm wafer seen here being held by Bernie Capraro of Intel with Bas centre and Leonard Hobbs of Intel looking on.



For those not aware of it, Bas van Nooten retired from ASM after 20 years in 2013 but is maintaining many of his activities on European R&D projects as an independent consultant.

And Finally

I'm sure everyone was saddened to hear of the death of Laurent Bosson in March. Laurent was one of the management team under Pasquale Pistorio who made ST grow so successfully in the 90s.

He ran the front end fabs at ST and became Chairman of the Board of ST America, and it was this vast experience that allowed him to contribute so much to early discussions and reports on the costs and benefits of 450mm processing to the European Commission.

RIP Laurent.