450MM CLUSTER

WITHIN SILICON SAXONY!

JOCHEN KINAUER, CLUSTER MANAGER
Agenda

› Information about the Silicon Saxony Cluster
› Vision / Mission for 450mm in Silicon Saxony
› Last years Activities
› 450mm Competence in Silicon Saxony
› 450mm Projects performed by our cluster members
Semiconductor history of Saxony

AZZURRO Semiconductor builds GaN wafer fab in Dresden
X-Fab invests in 8" Dresden wafer fab
Infineon buys Qimonda Dresden 12" fab for power
GLOBALFOUNDRIES and Infineon invest in Dresden fabs
GLOBALFOUNDRIES opens business

Plastic Logic – Start
NaMLab – Start

AMD Fab 38 ground breaking
First AMD production on 12-inch in FAB 36
Fraunhofer CNT opened

Launch of Siltronic 12-inch wafer production
AMD+DuPont+INFINEON decide on Photomask JV
INFINEON launches 12-inch chip production

AMD - Premier 1 GHz-Prozessor
SIEMENS-MOTOROLA 12-inch JV decision
Decision of AMD Microelectronics Fab
Decision of SIEMENS Microelectronics Fab
Privatization of ZMD

Founding of Arbeitsstelle für Molekularelektronik (AMD/AME)
SILICON SAXONY
Semiconductor Experience in Saxony
**SILICON SAXONY e. V.**

**Member Structure**

**Services**
- Service
- Consulting
- Financing
- etc.

**Research & Development**
- Universities
- Institutes
- R&D
- Training Facilities
- etc.

**Infrastructure**
- Facilities
- Software
- Materials
- Equipment
- Process-Service

**Supplier**
- Design
- Photomasks
- Semiconductor Fabs
- PV Fabs
- Test / Packaging
- Applications

**Diagram:**
- Administration: 18%
- Supplier: 48%
- Services: 16%
- Research & Development: 14%
- Infrastructure: 4%
VISION / MISSION FOR 450MM IN SILICON SAXONY
By 2018, Silicon Saxony will be seen as a trendsetter for innovative semiconductor manufacturing technologies for 450mm (and below) and may plan to install its 1st 450mm manufacturing site in the Dresden region.
Our Mission

- Share information about 450mm projects
- Support a European 450mm Cluster
- Conduct shared R&D projects for 450mm solutions
- Lobby for semiconductor industry for 450mm (and below)
  → in Europe, Germany and Saxony
- Support initiatives for projects around 450mm technology
- Provide a platform for companies, and institutes that are committed to our vision
LAST YEARS’ ACTIVITIES
February 2013
MoU between DSP Valley, Leuven & Silicon Saxony

> Clear commitment for joint 450mm R&D in Europe
April 2013
AK450 in New York State w/ Prime Minister Tillich

› 15 member companies of the AK450mm visited G450C, Globalfoundries and IBM
› Match Making Meetings at G450C
› MoU between SiSax and G450C
April 2013
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April and June 2013
Collaboration Workshops of IMEC, cfaed & FhG

- Cooperation of several Fraunhofer institutes of Dresden and IMEC, Leuven
- Lead Contacts IMEC: Roger de Keersmaecker, Luc van de Hove
- Lead Contacts Fraunhofer: Gerhard Fettweis, Hubert Lakner
450MM COMPETENCE IN SILICON SAXONY
Fraunhofer IPMS

→ Docking Research into Manufacturing

- Platform for material and process development on 300mm Si wafer
- Short learning cycles
- Industrial-grade clean room infrastructure
- Linked to 300mm production lines

800m² Clean Room Area
200m² Lab Area
40 Tools (Processing and Metrology/Analytics)

External customers (IC manufacturers, Foundries)
Entegris Products and cleaning for 450 mm

- **Wafer Transport**
  - Entegris worked closely with SEMI, Customers and OEMs to develop early generation functional products for Wafer transport that help to enable 450 mm development and validate SEMI standards.

- **Enhanced Contamination Control solutions**
  - Higher particle removal efficiency with larger filtration surface area
  - Tighter temperature and outgassing control with membrane contacting technology
  - Precise photo resist dispense using two stage technology
  - Accurate flow control of chemical fluids
  - Airborne Molecular Contamination (AMC) control and purification at process step and clean room levels

- **Entegris Cleaning Solutions** - the only comprehensive Service partner in the Semiconductor industry to develop best submicron cleaning solution of contamination challenge for 450 mm
  - Ultra Clean Process Optimization for Wafer & Reticle carriers (characterization, cleaning receipts, parts maintenance)
  - 15 years of submicron cleaning expertise
  - Scalable per demand
  - Experienced on various materials and components
  - Full contamination control via embedded analytical service
  - Quality inspection & control
start

- foundation: 1991 (background: ZEISS Jena)

company profile

- development, design, manufacturing of handling and robotics for wafer, carrier, PCB and of complex automatization

HAP capacity and business

- currently staff: 70
- design department: 22
- machinery 6
- assembling department, cleanroom 30
- management, purchasing, office: 12
3 Business Units

Installation & Service

Automation

Products
All side wafer inspection and review
Increasing yield, preventing disasters

Increased Quality Control needs:
• Process & Excursion control
• Increasing complexity
• Increasing value of Wafer
• 3rd party Wafer in foundry

Integratable and customized Systems
• process & excursion control
• flexible adaptivity into other systems

Automatic inspection
• wafer front-/back side and edge
• process control
• excursion management
• Very high productivity
• Up to 450mm

Automatic and manual review
• wafer front and back side
• Cutting edge microscopic review
• Multiple features for flexible use
• Up to 450mm
AIS Automation Dresden GmbH

- Manufacturing Automation / System Integration
  - Manufacturing Execution Systems (MES)
  - System and equipment integration
  - KPI analysis (Uptime, Yield, Throughput, OEE)
  - Framework for the structured collection of process data

- Control Systems/ Host Interfaces
  - Controls and host interfaces for different industries
  - Vacuum and thin film technology:
    - Controls for vaporization and sputter equipments
    - Plasma, ion and electron beam technologies
  - Semiconductor technology:
    - Cluster tool controller/ Inline controller
    - Process and Transport Module Controller
    - Host interfaces (SECS/GEM, Interface A, …)

- Facility automation
  - Facility monitoring and control systems
  - Specific knowledge of gas and chemical supply, clean room
SYSTEMA GmbH

// Increase of productivity and efficiency
  - Vertical integration from ERP to Shop Floor Equipment in Semiconductor, MEMS, Biotechnology and Automotive Industries

// MES consulting, implementation, extension & migration
  - Workstream Open
  - Workstream Classic
  - Promis MES
  - FAB300
  - SmartFactory
  - SAP ME
  - Eyelit
  - CellWorks
  - StationWorks
  - SiView

// Systema provides more than Software
  - Consulting and Evaluation
  - Development and Customization
  - Deployment, Operation and Support
  - Experience
### SILICON SAXONY

**Competence Matrix of all AK450mm Members**

<table>
<thead>
<tr>
<th>Company</th>
<th>Competences</th>
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<tbody>
<tr>
<td>AIS Automation</td>
<td>Equipment Control - Cluster Tool Controller; Equipment Integration (SECS/GEM, GEM300, InterfaceA); Fab Automation (MES, OEE, EDA FW); Process &amp; Facility Control</td>
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<tr>
<td>Brooks</td>
<td>Atmospheric &amp; Vacuum Robotics; HW Automation, Tooling</td>
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<td>Roth &amp; Rau Ortner</td>
<td>Fab Automation; AMHS, RFID</td>
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<tr>
<td>FhG (CNT)</td>
<td>Analytics; Front- &amp; Backend Process Development and Integration; 300mm Device short loops; Wafer processing for 200mm &amp; 300mm and wafer coupons</td>
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<tr>
<td>FhG (FEP)</td>
<td>Tools and technology for thin film deposition + process control (450mm single wafer process + lithography optics (UV, EUV), PVD, PECVD, dry plasma etch)</td>
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<td>Entegris</td>
<td>Wafer Carrier; Cleaning Service; Chemical and Gas Filtration; EUV Reticle Pods; Photolitho Dispense Systems</td>
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<td>MCRT Micro Cleanroom Technology</td>
<td>Cleanroom Technology and Contamination Control</td>
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<td>SIP GmbH</td>
<td>Clustermanagement &amp; Project Coordination</td>
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<td>znt GmbH</td>
<td>MES; Equipment Integration</td>
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<td>SYSTEMA GmbH</td>
<td>Equipment Integration; MES consulting - implementation – migration; Recipe &amp; Capability Mgmt; Single substrate tracking</td>
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<td>Qoniac GmbH</td>
<td>Process Optimization &amp; Control (esp. In the field of Lithography) for leading edge fabs</td>
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<td>HSEB GmbH</td>
<td>Optical Inspection and Metrology; Optical microscopy for 450mm and smaller</td>
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<tr>
<td>Vistec GmbH</td>
<td>Ebeam Lithography</td>
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<tr>
<td>HAP</td>
<td>Robotics; HW Automation; Endeffectors for 450mm Wafers (and smaller); Backside &amp; Edge Gripping available</td>
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<td>TU DRS</td>
<td>Software for Process Identification; APC, Predictive Maintenance and Logistics Optimization</td>
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<tr>
<td>Freiberger Instruments GmbH</td>
<td>Contactless electrical Characterisation equipment</td>
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450MM PROJECTS PERFORMED BY OUR CLUSTER MEMBERS
## Overview of 450mm activities in Europe - Timelines

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Overview of 450mm activities in Europe

- Proof of Concepts and Specification (control platform)
- Develop prototypes (control platform)
- Drive standardization task
- Optimization production processes
- Proof of concept (Idle/Green Mode, Predictive Maintenance)
- Equipment demonstration and evaluation

Source: ASML
**HAP 450mm EU Projects**

**Gripper for 450mm wafers**
- wafer handling by using a 6 axis robot: TX60SCR
- no slip of wafer (acceleration > 1.5g on 2 combined horizontal axis, vacuum 600mbar)
- no slip during vertical orientation and move (acceleration 0.2g, vacuum 600mbar)
AIS 450mm EU Projects

EEMI450 Project
- WP 2.1 Specification of Common Cluster Platform with Focus on Software Interface Standard
- WP 2.3 Optimization of Interface A

NGC 450
- WP 2.1 Control Software Platform

EEM450PR
- WP 4.1 Idle (‘Green’) Modes
- WP 4.3 SW req. for Manufacturing Automation

E450EDL Control SW Platform
- WP 6.2.1 Equipment Automation & Integration

Project Partners: IMEC, Intel, Nanoplas, Edwards, ASYS, RECIF, IBS, IISB, HQ-D, AIS
CLUSTER MANAGER SISAX 450MM CLUSTER:

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