Yield Enhancement Through Inline Wafer Edge Inspection

Robin Priewald, Dipl.-Ing. Dr.
Director of R&D at Bright Red Systems GmbH
The Problem: Wafer Edge Defects

- Breakouts, Chips, Dents, etc.
  - cause Yield Loss
  - can propagate, leading to total breakage
  - produce contamination
  - cause equipment downtime
$339 Billion worldwide semiconductor sales (2016) [1]

74% of wafers get thinned [2]

50% less yield in edge region [3]

30% of killer defects originate in edge region [3]

$~8 Billion estimated total loss (2016) due to edge defects

Sources:
[1] Semiconductor Industry Association (SIA)
[2] SiS Silicon Semiconductor
[3] Yield Management Solutions, KLA-Tencor
Inline Edge Inspection as a Solution

- **Integrated Multi-Point Bevel Inspection**
  - as Add-On to Aligners in existing Equipment
  - provides geometrical (2D) bevel data

- **Advanced Embedded Data Analytics:**
  - Detection and Discrimination of Notch and Defects
  - Classification of Features using AI
  - Characterisation of Defects (Length, Depth, ...)
  - Wafer Bow
  - Alignment Vector (also for very warped wafers)
  - Center Displacement (bonded wafers)
  - Parameter statistics
  - ...
Ultra-small form factor for all-in-one edge inspection system
Add-on to existing equipment
Works with any material (Si, SiC, glass, …)
Fully automated embedded signal analytics
Proprietary, patented new technology
Our Customer’s Benefits

No Extra Cleanroom Space Required
Save Inspection Time
100% Wafer Coverage
Identify Flaws Early and Optimise Processes
Improve Yield and Overall Profits
Who We Are – The Core Team…

**Thomas Jerman**  
Shareholder and Founder since 2011, CEO  
MSc in Electrical Engineering

**Robin Priewald**  
Shareholder since 2013, CTO  
MSc and PhD in Electrical Engineering

**Tatiana Strapacova**  
Shareholder since 2015  
MSc and PhD in Electrical Engineering

**Iñaki Lujambio**  
Embedded Systems Engineer since 2014  
MSc in Electrical Engineering

**Christian Mentin**  
Electronic Design Engineer since 2014  
MSc and PhD (pending) in Electrical Engineering

**Andreas Auer**  
Embedded Systems Engineer since 2013, self-employed  
MSc in Electrical Engineering
<table>
<thead>
<tr>
<th>Name</th>
<th>Duration</th>
<th>Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edorta Undabarrena</td>
<td>8 months, 2013</td>
<td>MSc in Electrical Engineering</td>
</tr>
<tr>
<td>Jon Garcia</td>
<td>8 months, 2014</td>
<td>BSc in Electrical Engineering</td>
</tr>
<tr>
<td>Alberto Alonso</td>
<td>8 months, 2015</td>
<td>Bachelor in Business Administration</td>
</tr>
<tr>
<td>Mariana Nastas</td>
<td>6 months, 2016</td>
<td>Master in Business Administration</td>
</tr>
<tr>
<td>Argider Valentin</td>
<td>6 months, 2017</td>
<td>Bachelor in Advertising and PR</td>
</tr>
<tr>
<td>Pablo Sanz</td>
<td>6 months, 2017</td>
<td>MSc in Mechanical Engineering</td>
</tr>
<tr>
<td>Victoria Kogler</td>
<td>since 2016</td>
<td>Administration Support</td>
</tr>
<tr>
<td>Edorta Perez</td>
<td>from 2018</td>
<td>MSc in Control Engineering and Automation</td>
</tr>
</tbody>
</table>
Business Model

Inline Wafer Edge Inspection System

as a Product for Semiconductor Manufacturers

as a OEM Product for Equipment Manufacturers

Integration Service and Product Customisation for specific needs
Other Inspection System Providers

- KLA-Tencor
- RUDOLPH Technologies
- KOBELCO
- ZETA Instruments
- HOLOGENiX
- Lasertec
- APPLIED MATERIALS®
- Confovis
- KoCos
Status Quo

• Ready for first Test Installations

• Already some signed NDAs for tests exist
  ➢ a few system integrators
  ➢ two multi $B semiconductor manufacturers

• Pilot Installation with Integration to MES
  ➢ at a local fab
  ➢ part of larger R&D collaboration over next two years
Financials and Outlook

- Cumulative R&D Investment since 2011: ~1.1 M€

- Planned R&D Investment until end 2019: 0.9 M€
  - Comprises R&D for:
    - Advanced Signal Analytics and Classification
    - Improving Accuracy to <5 µm
    - Pilot Installations, Integrations and Testing with Lead Customers
  - Pending full grant approval, investment mostly secured

- Extra Equity Invest Sought within next year: 2 M€
  - Engineering, management & marketing staff
  - Marketing and Go-to-Market efforts
  - Relocate to larger office with cleanroom for production
• Costs until 2019 are 0.9 M€

• Target Sales by 2020:
  ➢ Reach 100 pc (desired)

• Target Sales by 2021:
  ➢ Reach 250 pc (desired)
Thank you