

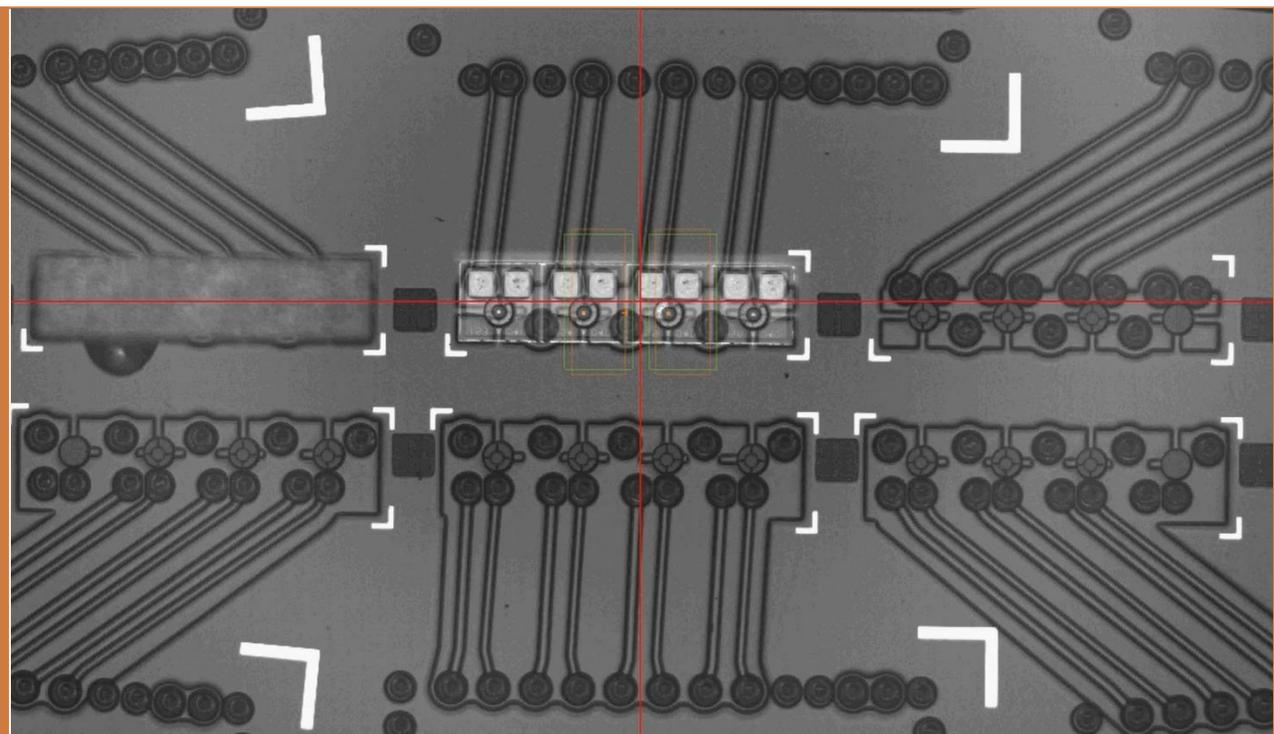


IVAM Mid Week Coffee Break

A MICRON AWAY FROM PERFECTION

Processes and benefits of Passive Alignment

December 15, 2021

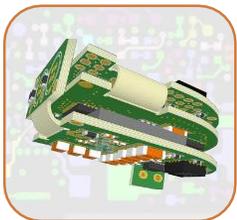


STRATEGIC TECHNOLOGY-PARTNER FOR ADVANCED MICRO-SYSTEM AND OPTO-ELECTRONIC & PACKAGING SERVICES

AEMtec is a best-in-class expert for product / process development & production of high-end opto electronic modules to complete devices

That's what we stand for:

A unique combination of a strong engineering team, flexible production and supply chain services in conjunction with a wide range of latest and unique packaging technologies.



Some facts about us:

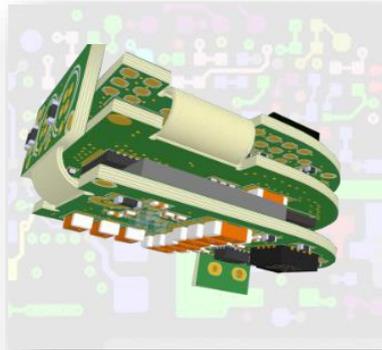
- Founded in 2000 as a spin-off from Infineon Technologies AG
- Continuous, healthy growth
- Headcount > 200 employees
- > 50 people working in Engineering
- 50+ MEUR in revenue
- All-Volume Clean Room Production

Excellence in (opto) electronics offering high-end chip level technology services from product / process development to packaging

**PRODUCT & PROCESS
DEVELOPMENT**

**VOLUME
PRODUCTION**

**SUPPLY CHAIN
MANAGEMENT**

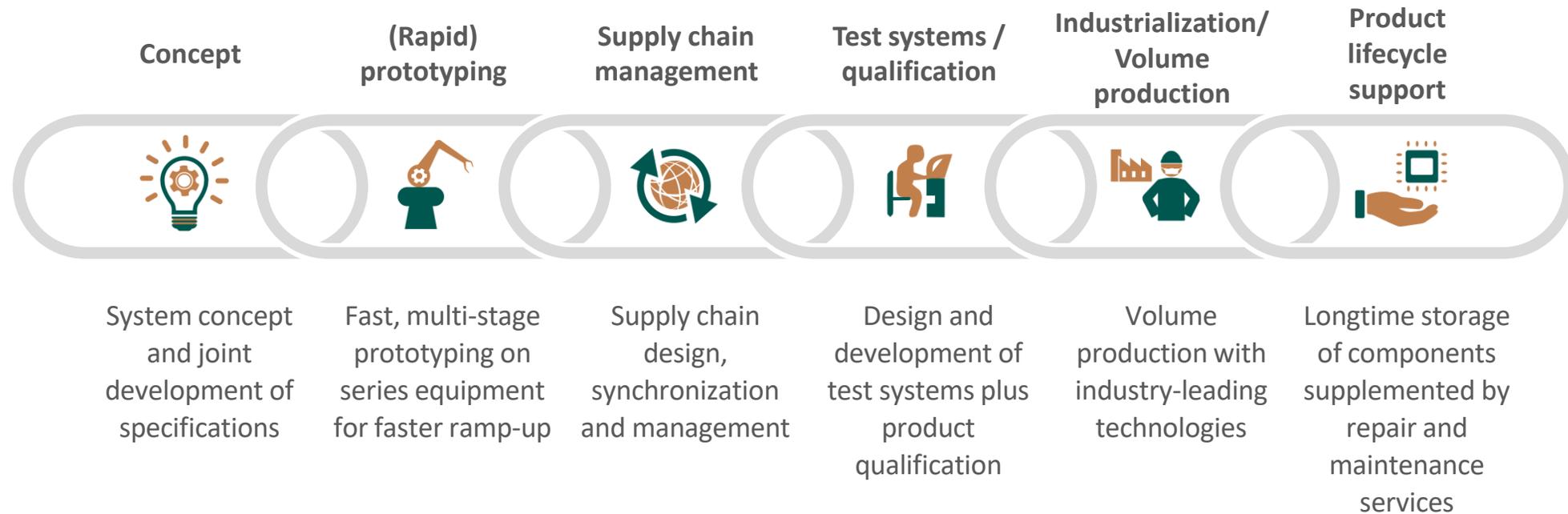


Areas of Excellence

Strategic partner for customized advanced electronic packaging

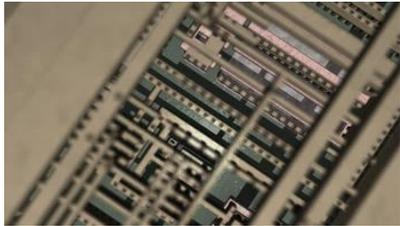


Key services



Wafer back-End

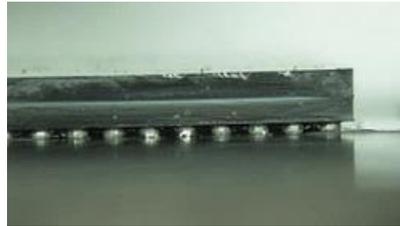
UBM, balling, dicing



- Under bump metallization (UBM)
- Solder balling
- Fully automatic: Dicing, cleaning and UV-exposure
- Au-stud bumping

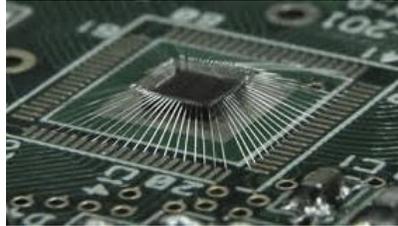
High-Precision Packaging & Testing

Flip chip



- Soldering
- Gluing (ACA, ICA, NCA)¹⁾
- Copper pillar
- Thermocompression / thermosonic bonding
- Underfill

Chip on board



- Die bonding
- Al and Au wedge and ball bonding
- Encapsulation
- 2.5D / 3D packaging
- System in package

Positioning, Soldering, Testing

Surface-mount technology



- 01005 (mils) / 0.25mm x 0.125mm
- Selective soldering
- Restriction of hazardous substances (RoHS)-compliant processes

Module & System Assembly

System integration



- Product co-development
- Prototyping + industrialization
- Serial production including repair service
- Worldwide supply

On all common substrates

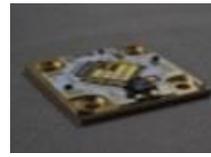
Selected use cases



Computer tomography



Hearing aids and components



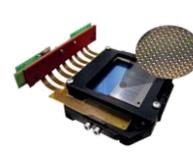
Professional lighting



Multi-channel optical transceivers



Medical-grade wearables



Optical reference modules



Optical sensors



Pressure sensors



Automotive development systems

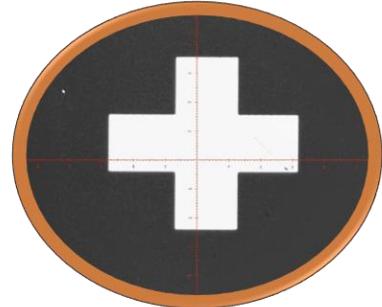
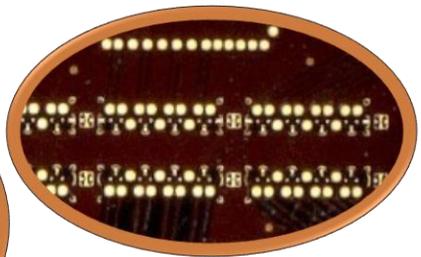
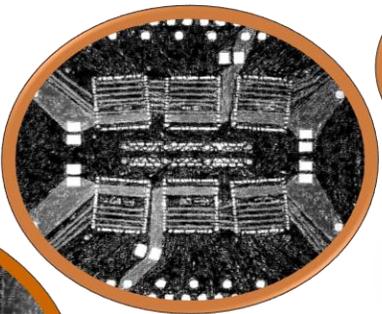
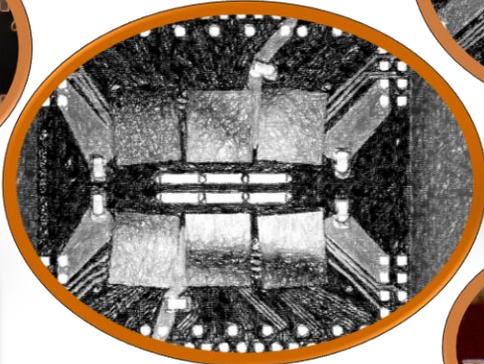
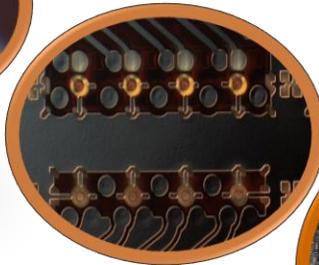
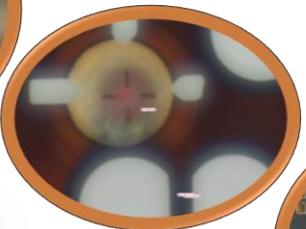
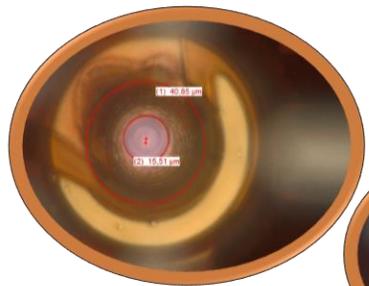
- **Process and benefits of passive alignment**
 - Embedded in the equipment (cmk)
 - Embedded in the process (cpk)
- **Focus on the real challenging part**
 - Interaction of placement, force and bonding parameters
 - The merge of cmk and cpk for reliable products
- **In general: What's your benefit from the two worlds**





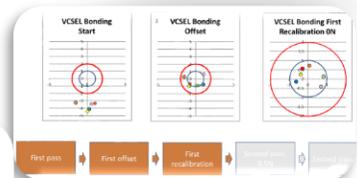
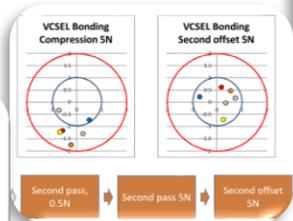
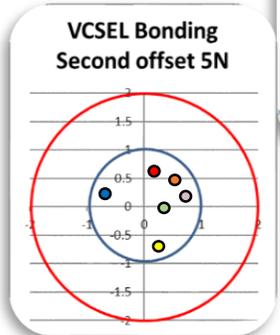
THE CHALLENGE

to cope with different influencing factors

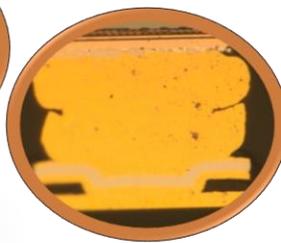
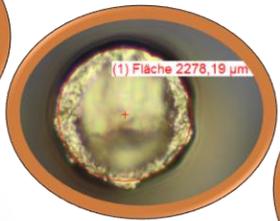
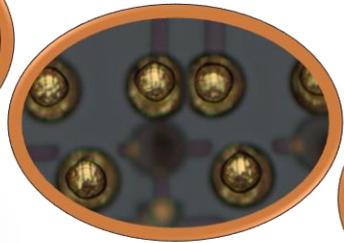
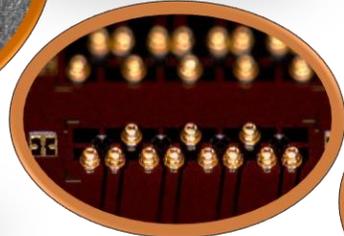


Optics and recognition

Material and material properties

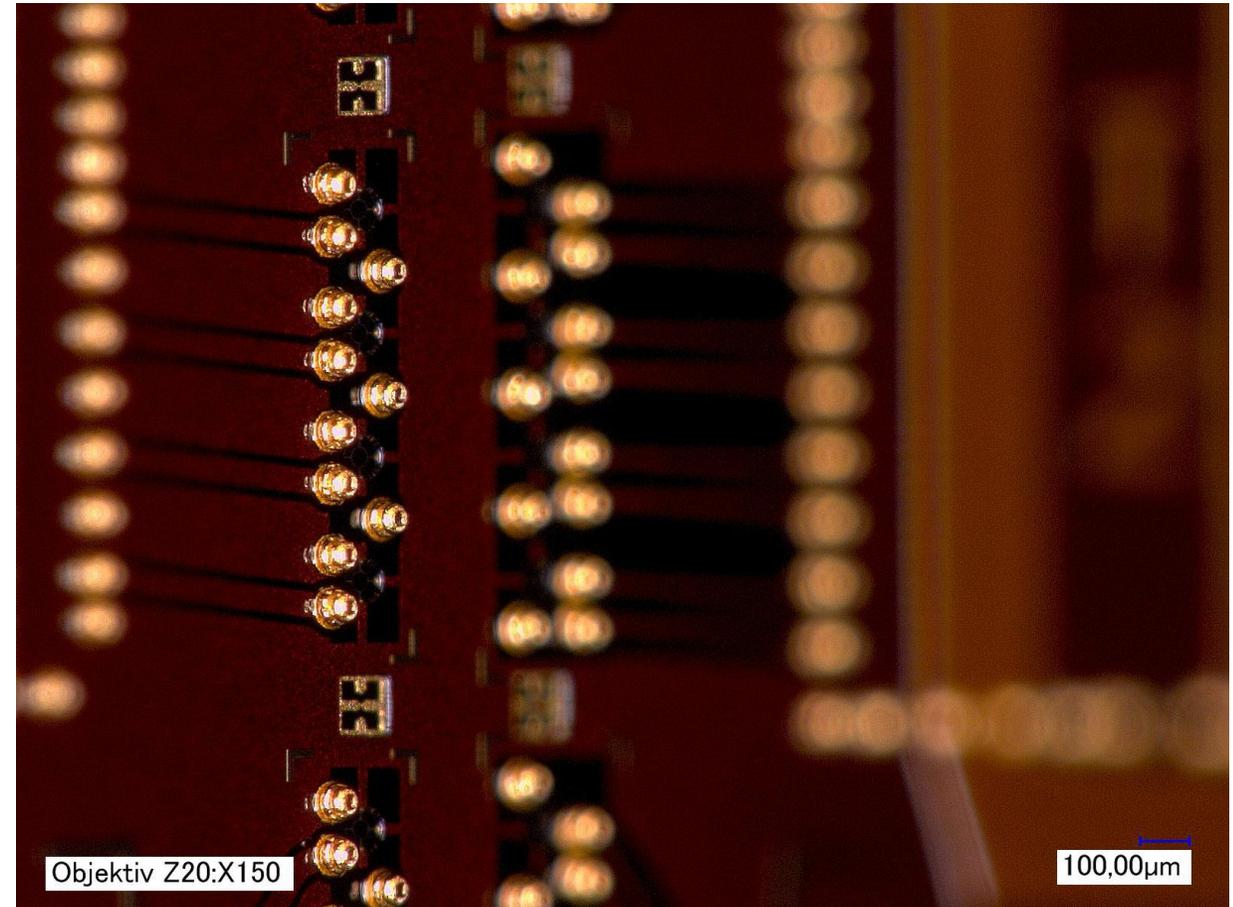
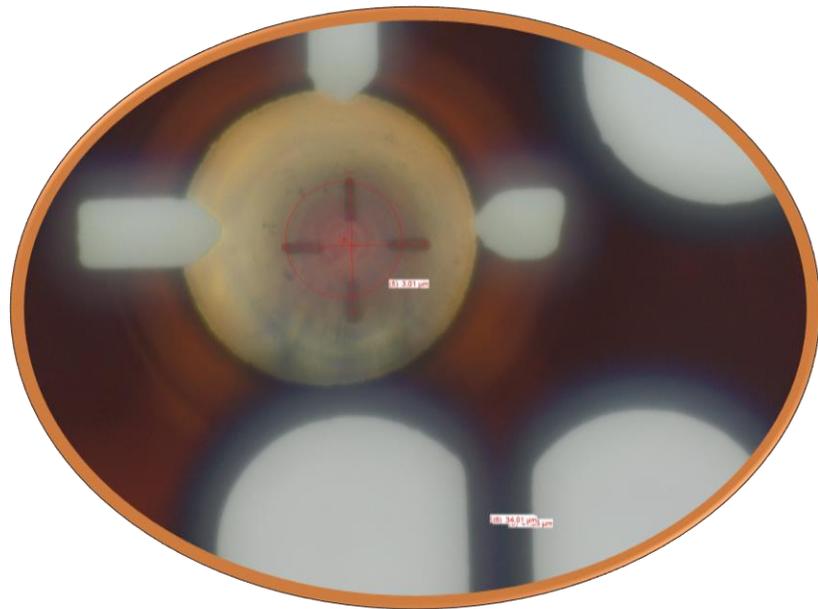


Iterative process mastering



Processes, reliability and repeatability

- Accurate placement $<1\mu\text{m}$ of a VCSEL array
- Thermocompression of coined gold stud bumps
- Compression force
- Measurement of position through transparent substrate

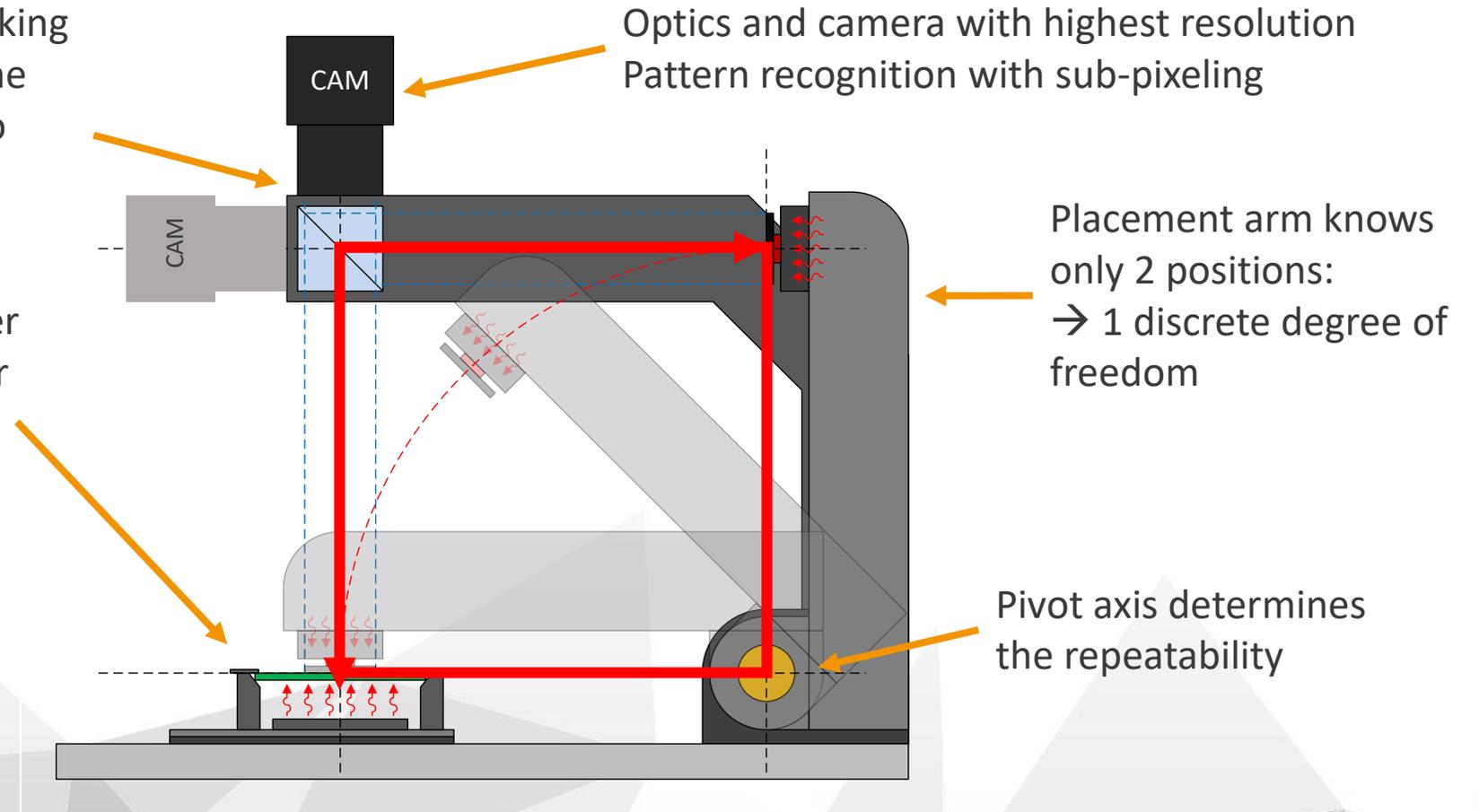


THE PLACEMENT PRINCIPLE

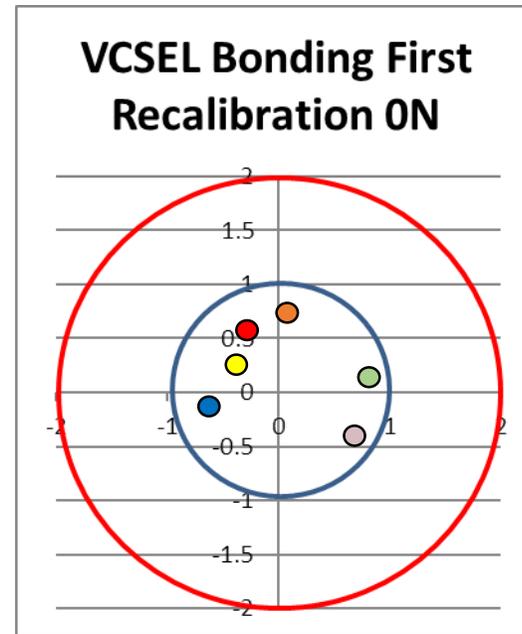
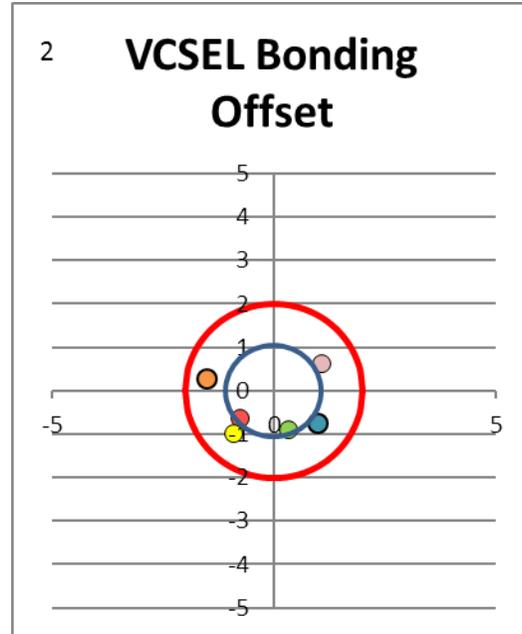
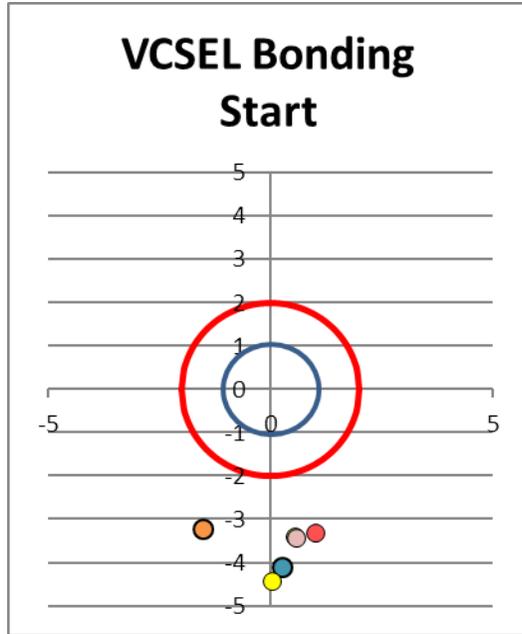
Fixed beam splitter / camera pair looking at chip and substrate at the same time
→ Image overlay can be calibrated to represent the placement result

Moving table with micrometer screws or high accuracy linear drives

- Temperature compensation to gain more stability over time
- Autocal function to compensate systematic offsets and drifts



PROCESS DEVELOPMENT STAGES



First pass



First offset



First recalibration



Second pass, 0.5N

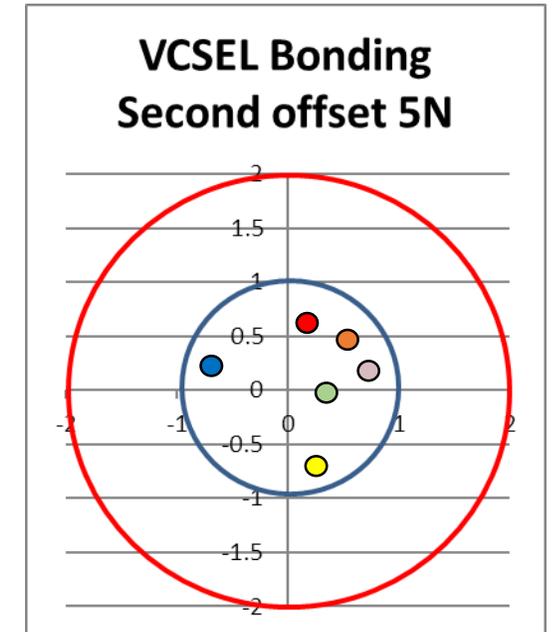
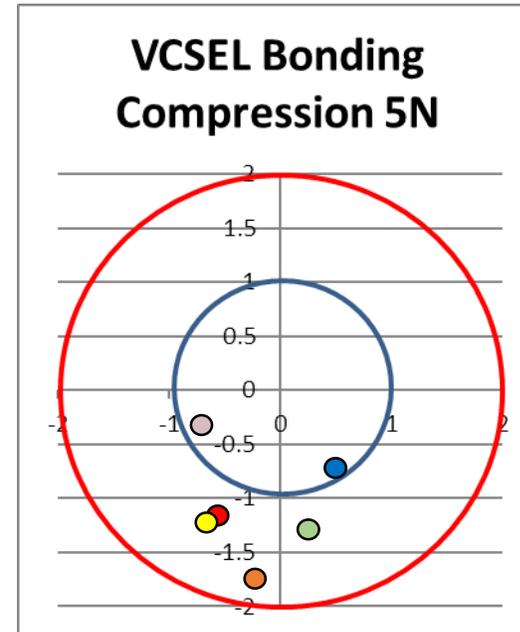
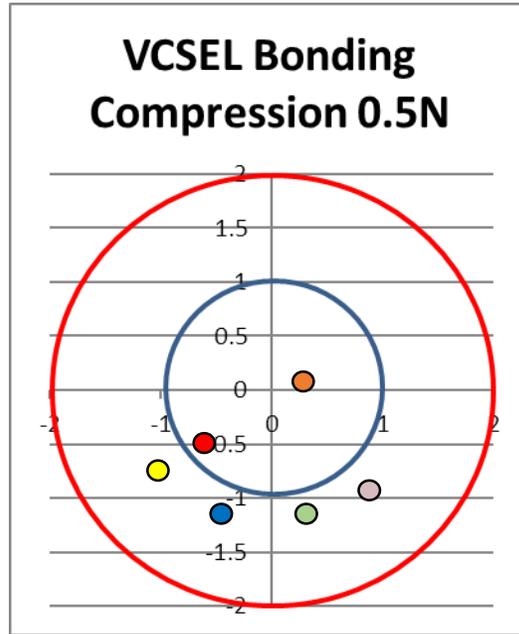


Second pass 5N



Second offset 5N

PROCESS DEVELOPMENT STAGES



First pass



First offset



First recalibration



Second pass,
0.5N



Second pass 5N

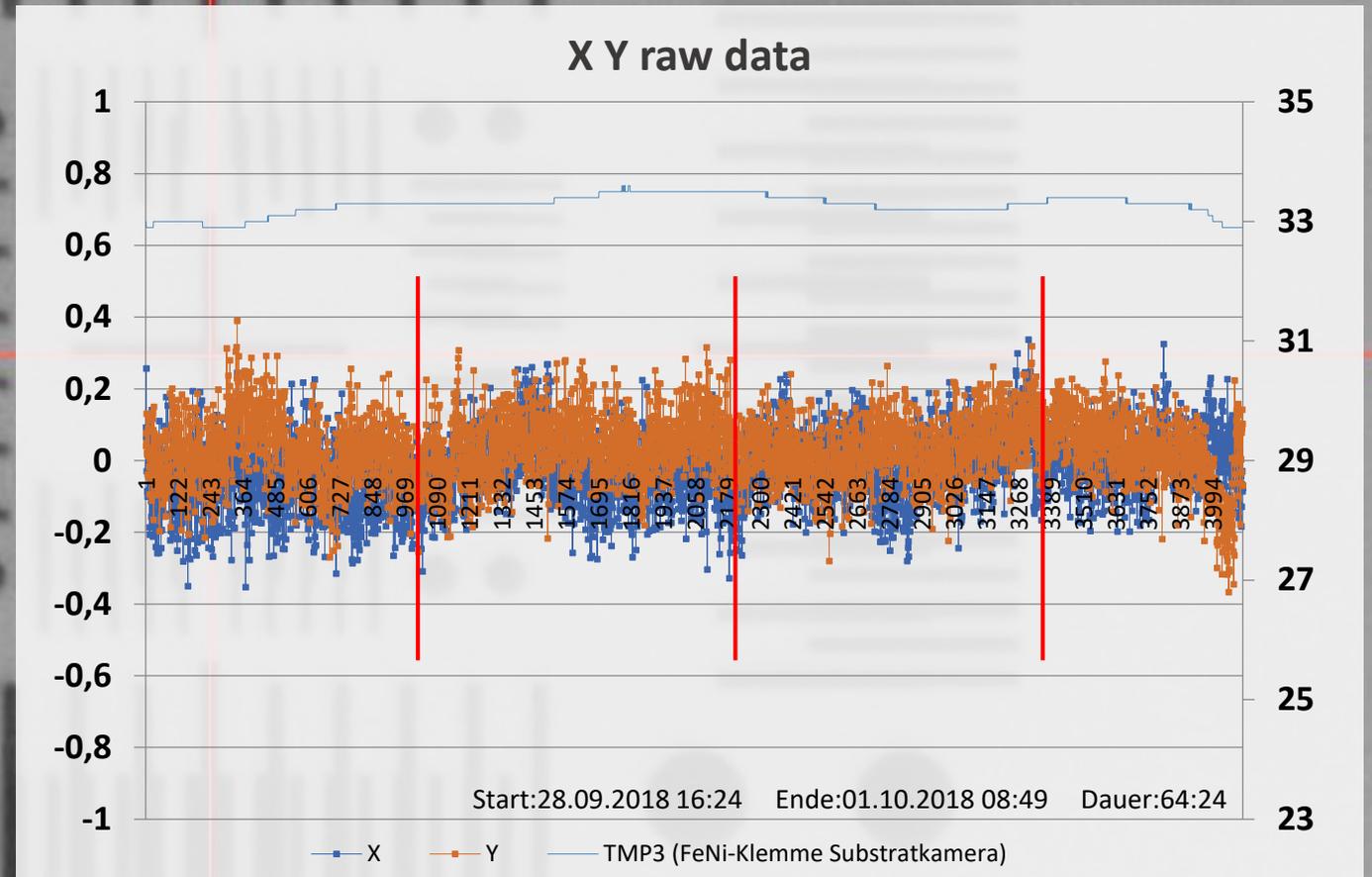


Second offset
5N

WHAT WE HAVE ACHIEVED

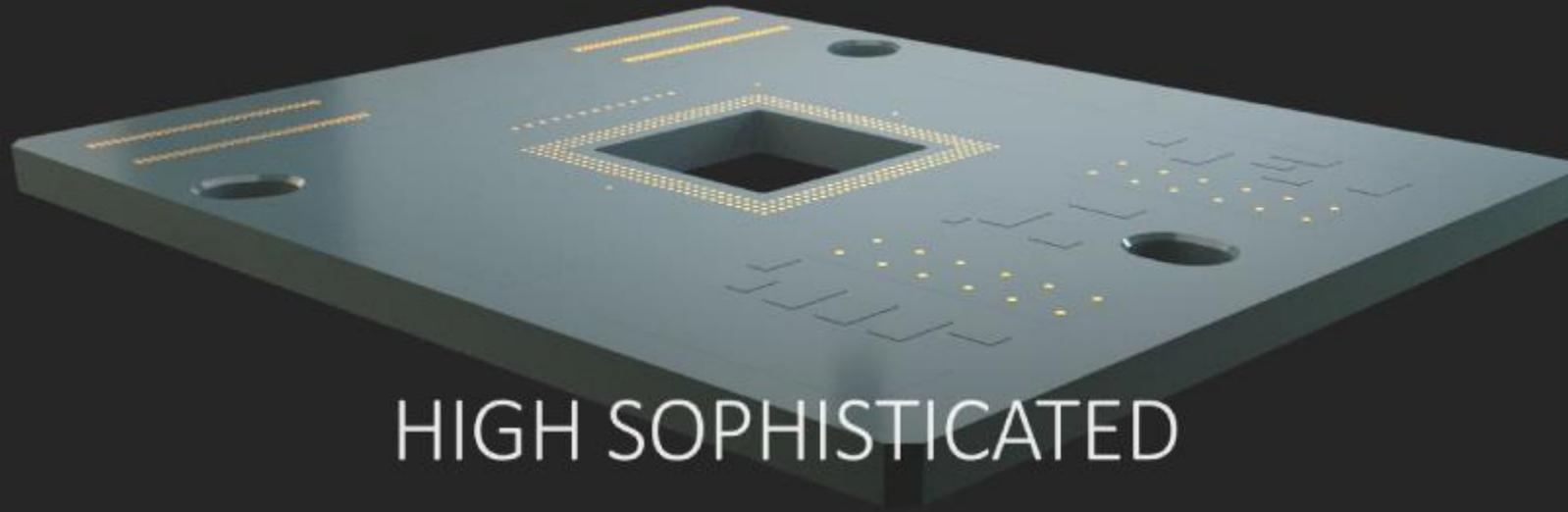


- Equipment in use has to pass 0.3 μm @ 3s specification
- Machine capability test with glass chip
- Graph shows long run with autocal every 150 cycles

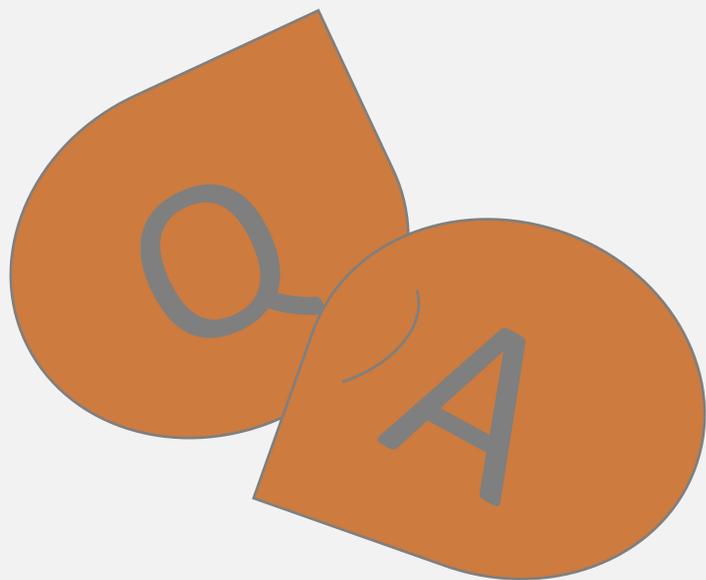


- **Approach**
 - Even for highest requirements passive and active alignment co-exist
 - Each can be used at either stage of the assembly
- **Alignment**
 - the advantage of the passive alignment is the relative simplicity (look for fiducials, align and place)
 - Active alignment targets the ultimate performance
 - At the same speed to reach the position, passive alignment is thus cheaper
- **Well established and reliable technology**
- **Highest flexibility**
 - Versatile equipment
 - Repeatable and controlled processes
- **Fundamentally, you should always look for the most effective solution, not just only in terms of costs**





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AND
SYSTEM INTEGRATION



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THANK YOU !