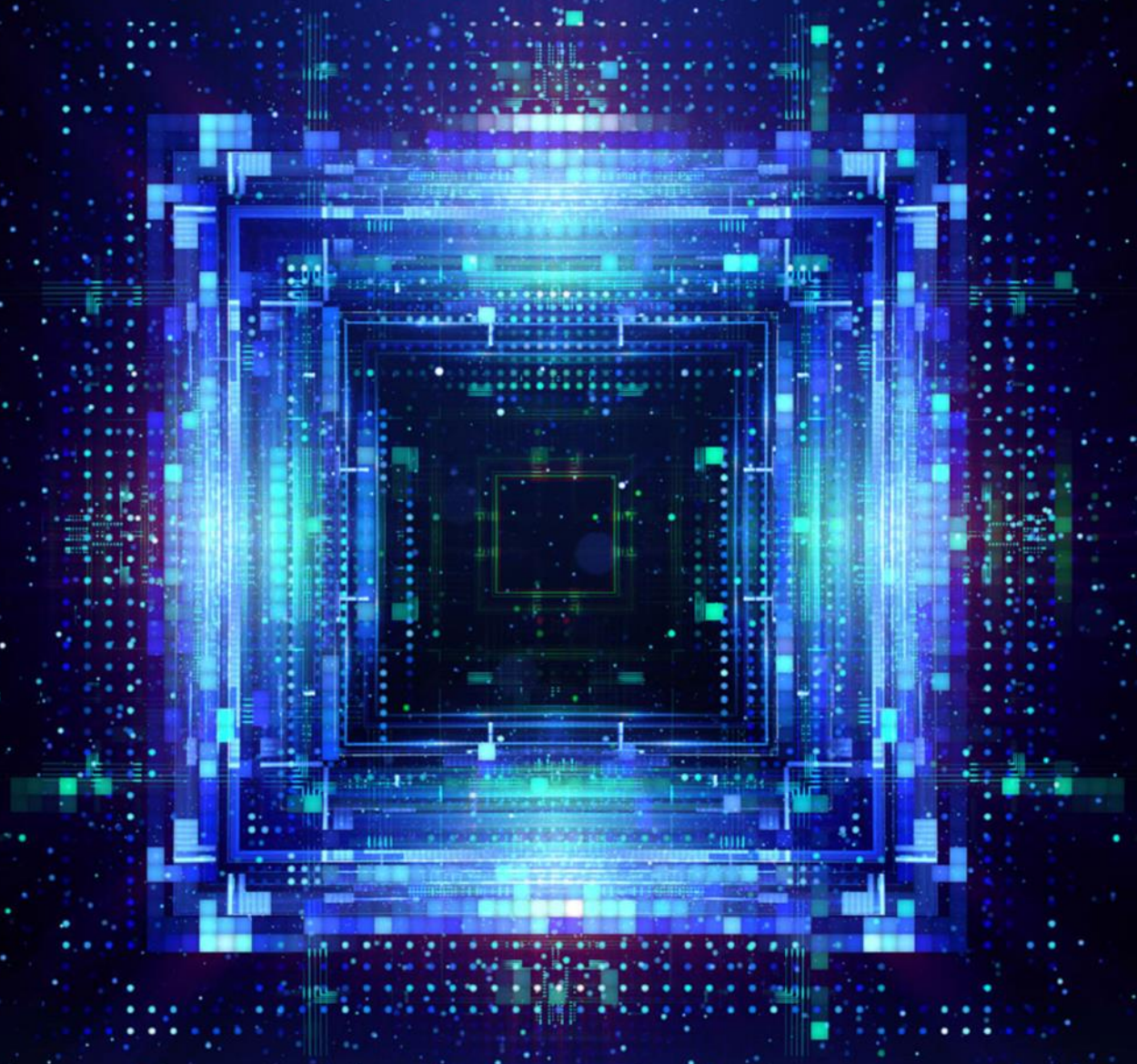
comptek solutions

Boosting the efficiency of compound semiconductor devices



Who We Are

Specialized in providing chip-specific custom passivation solutions

Unique expertise in compound semiconductor surface engineering

Proprietary technology that greatly improves the performance and manufacturability of compound semiconductors devices

Contributing to **global environmental sustainability** by improving the efficiency & manufacturing yields of billions of III-V devices

comptek solutions

- **Incorporated in 2017. Spin-off from University of Turku, Finland**
- **17 people**
- **Own laboratories and HQ in Turku**
- **5 granted patent families (27 patents) + 2 new filings**
- **Extensive processing characterization capabilities for III-V materials**

MIA Member

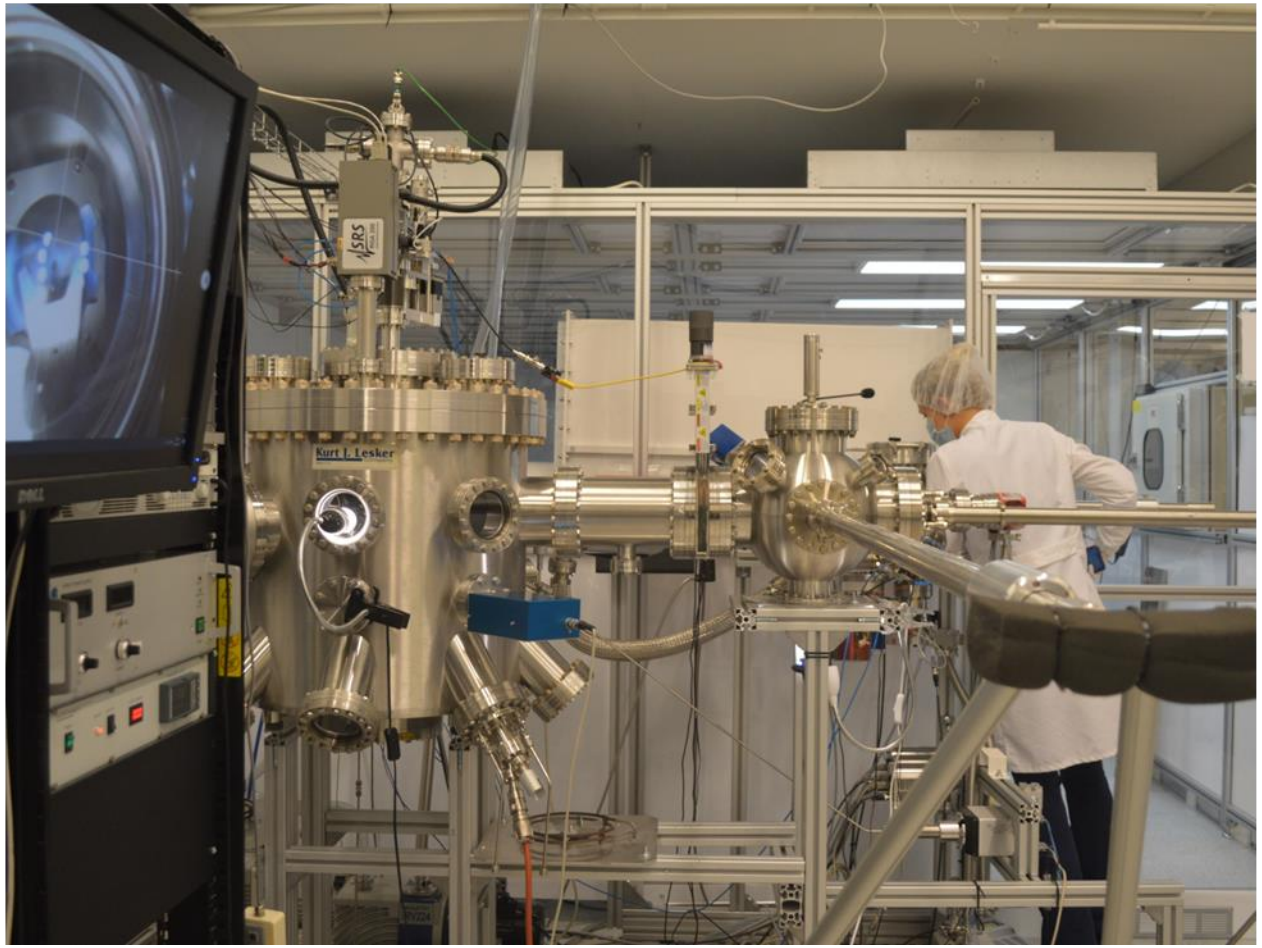
MEMBER OF EPIC EUROPEAN PHOTONICS INDUSTRY CONSORTIUM

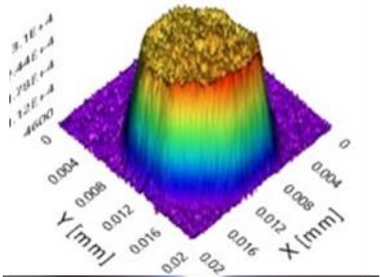
Photonics Finland

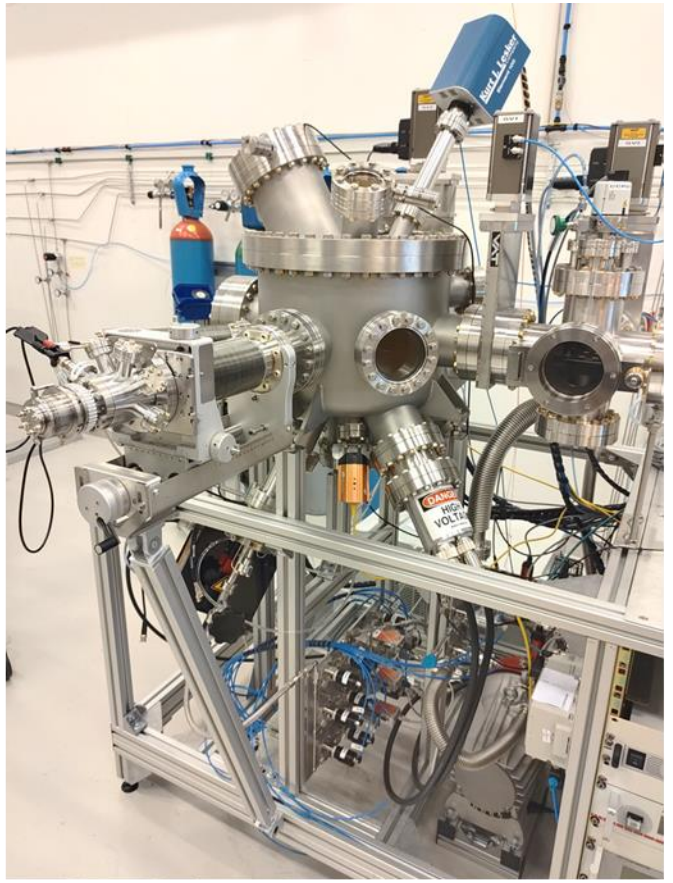
European Innovation Council

Cutting edge lab

Multiple processing capabilities
3 Kontrox reactors







Characterization

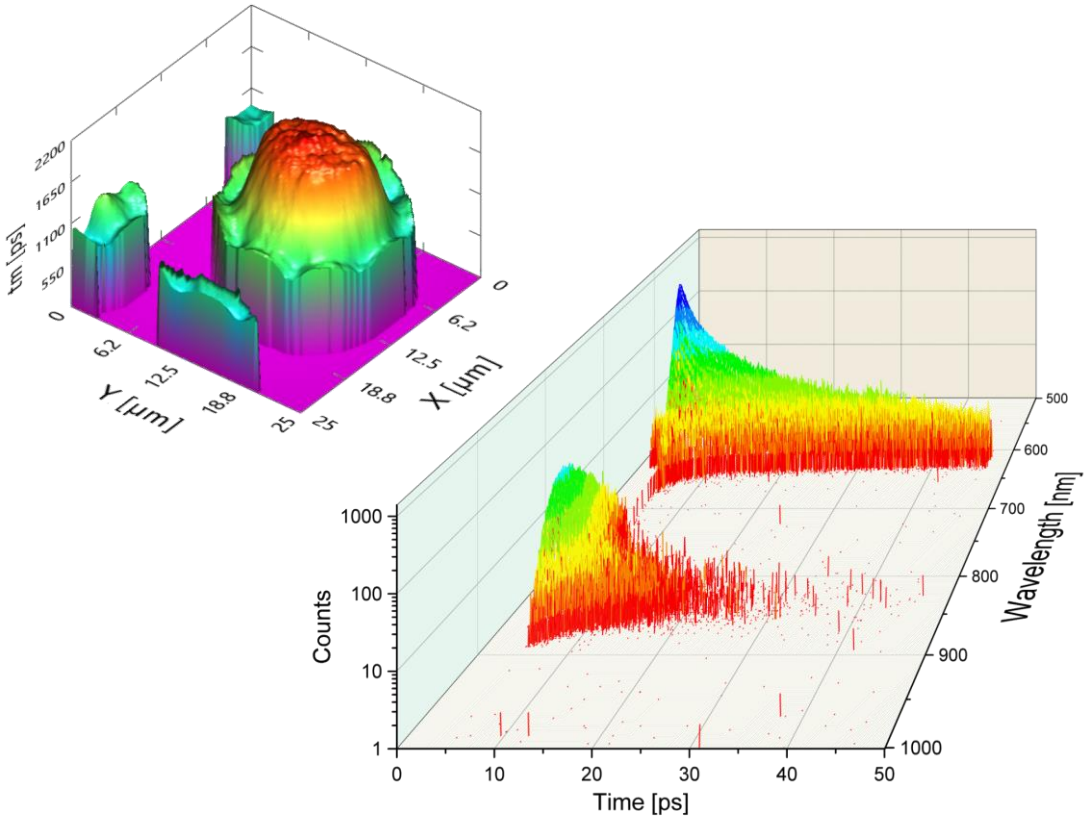
Semiconductor device and materials

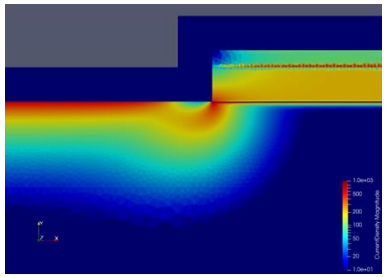
- LIV
- C-V
- Auger Electron Spectroscopy / XPS
- SEM/EDX
- Cathodoluminescence
- Reflection High Energy Electron Diffraction (RHEED) & Low Energy Electron Diffraction (LEED)
- Mass spectrometry, UV-VIS spectroscopy
- SPM / HR-TEM

Advanced optical techniques and proprietary hardware for optoelectronic devices

- Multiple inspections in one tool: PL and TCSPC (carrier lifetime), combined with wavelength resolved measurements for in-depth chip characterization
- Outstanding resolution and high-speed measurements
- Full wafer or single pixel characterization

Multiscale TCAD simulations





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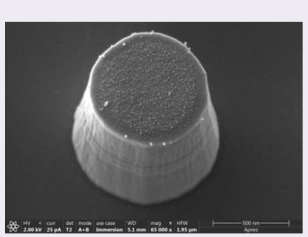

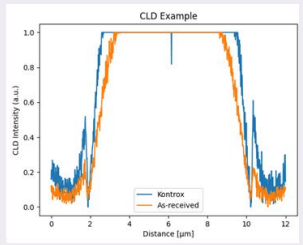

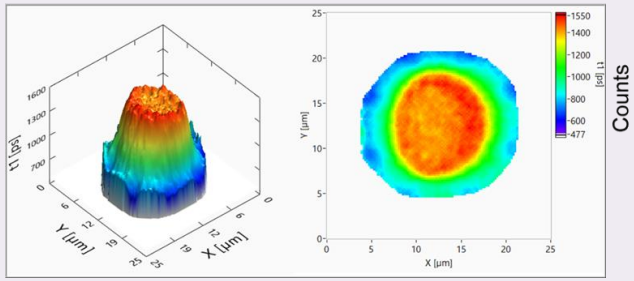

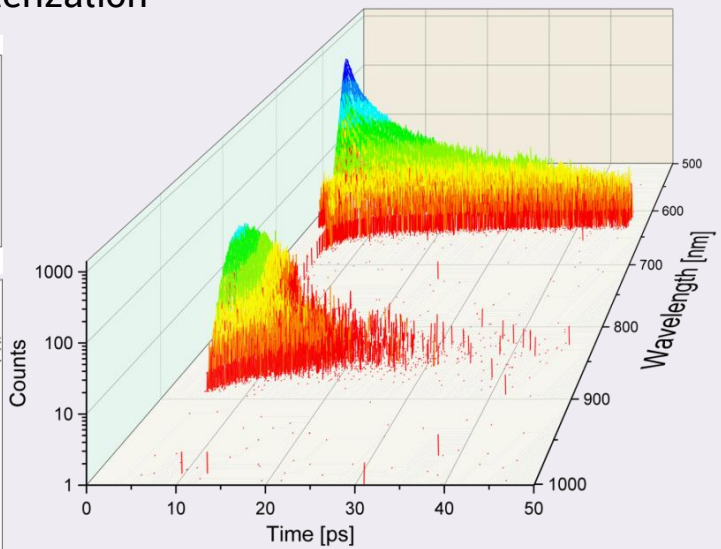

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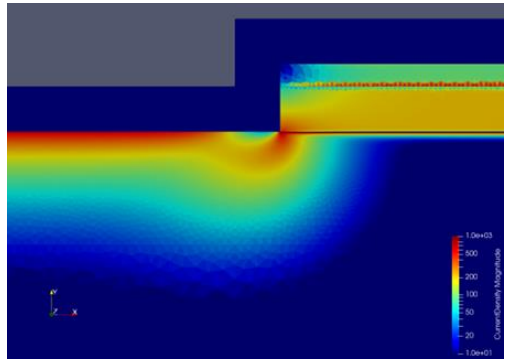
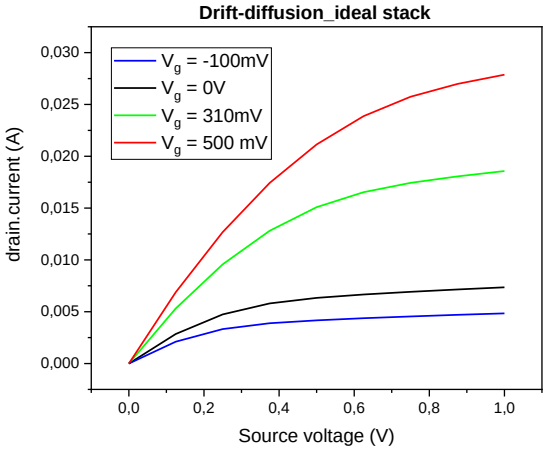


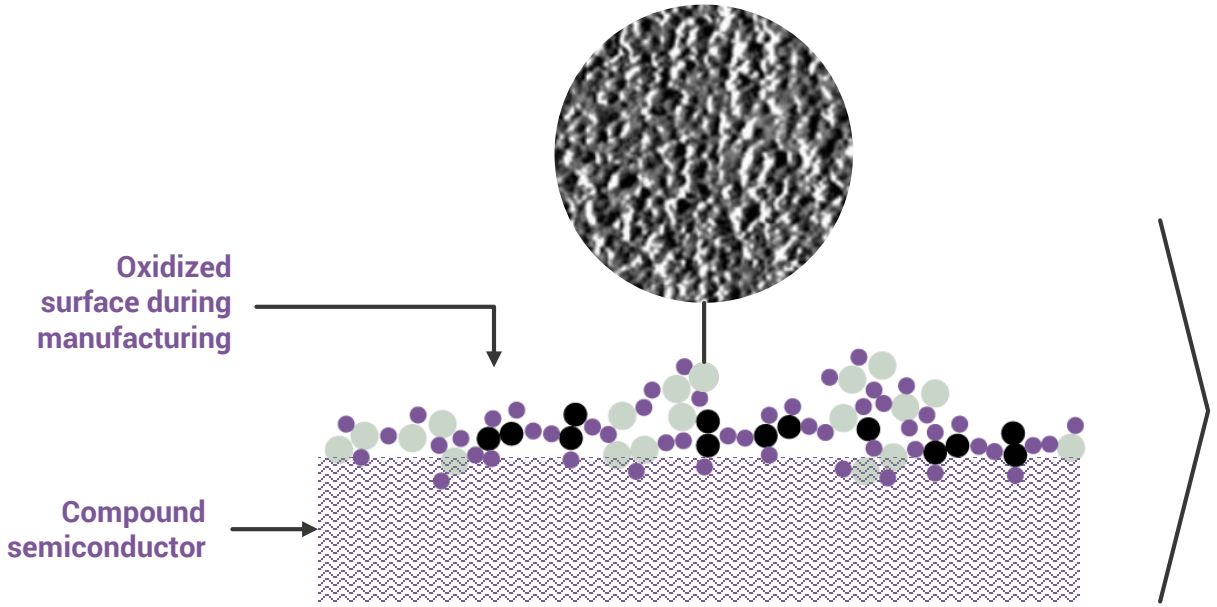


Why Comptek

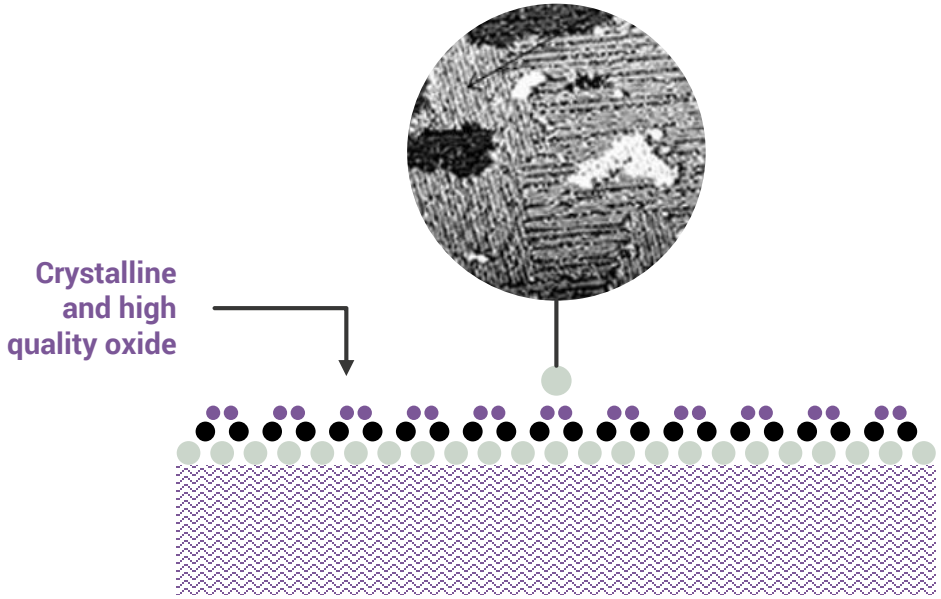
Kontrox™

Breakthrough nanoengineering technology

Existing technologies result in high density of atomic level defects



Defect free surfaces



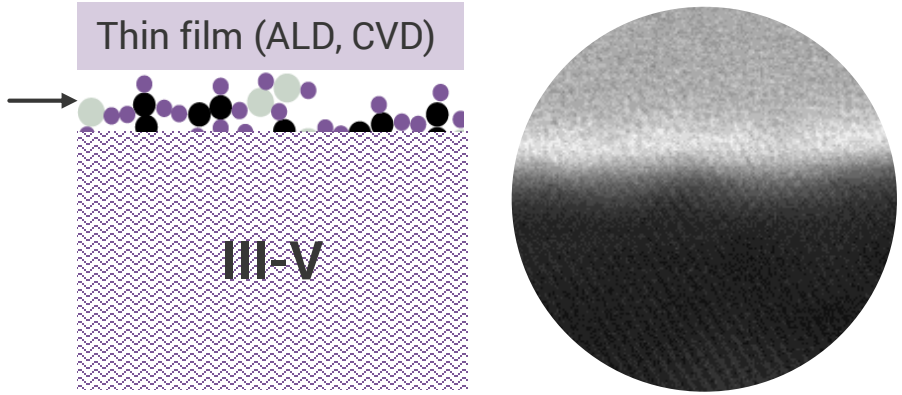
1st time ever to control oxidation in compound semiconductor materials

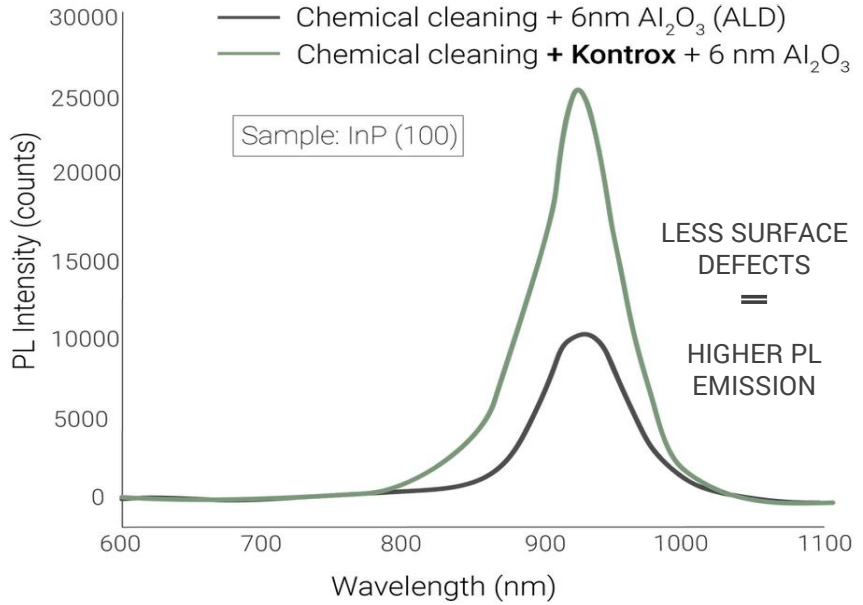
- 98% less defects
- Unprecedented device performance
- Higher manufacturing yields

Complementing Traditional Methods

Interfaces between III-V material and traditional thin films still presents high density of defects.

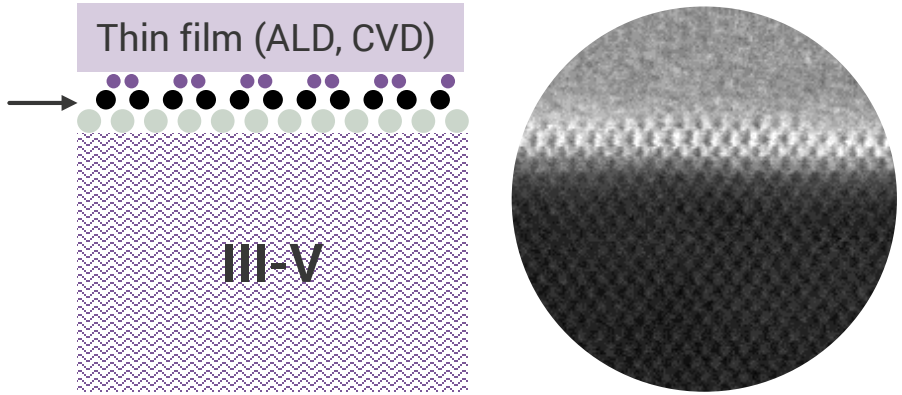
Interface gets oxidized during the first steps of the thin film deposition





Kontrox™ **complements** and **improves** conventional methods to enable the next generation of compound semiconductor devices

KONTROX high quality oxide stable during thin film deposition



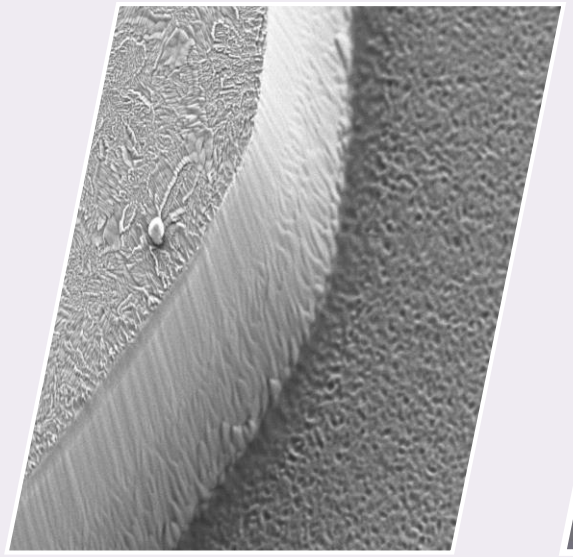
Best-in-class Interfaces

Kontrox™ + ALD/CVD

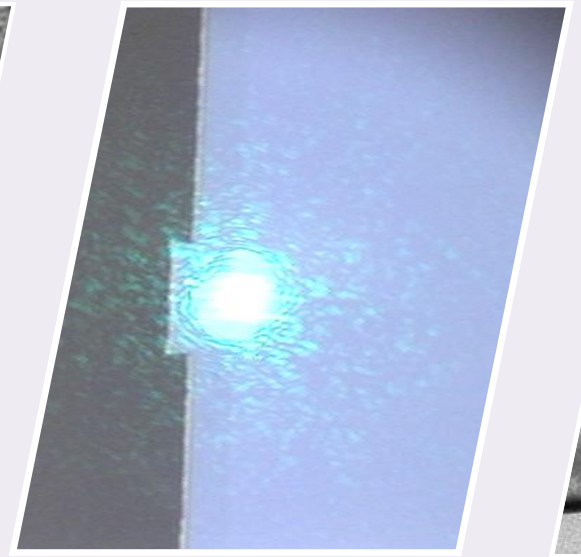
+

Applications

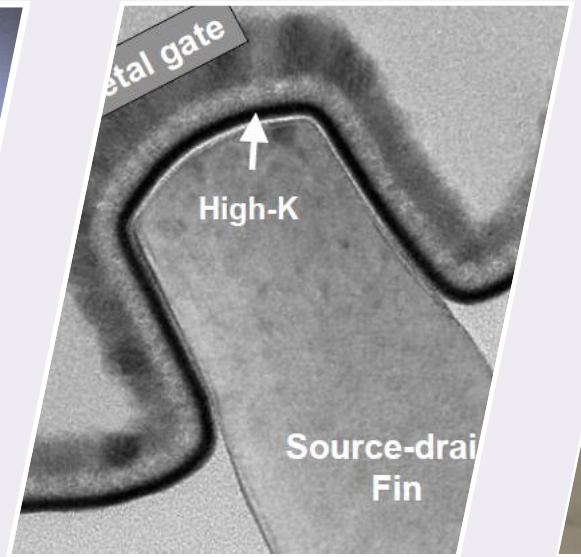
GaAs AlGaAs InAs InGaAs InAlGaAs InP GaSb InSb InGaP GaP
InGaAlP GaN InGaN AlGaN & more



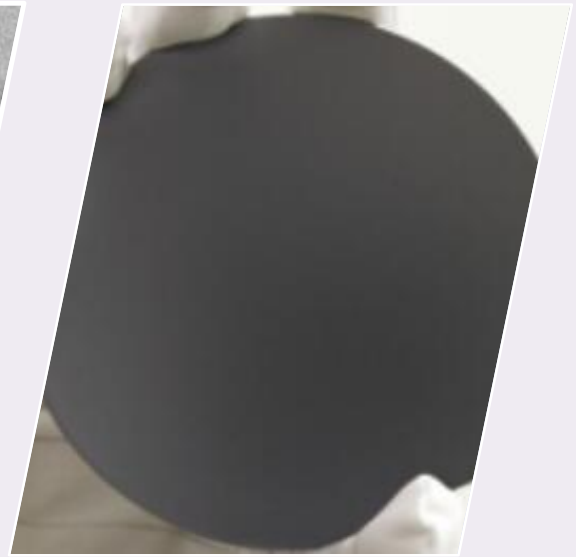
Mesa
Sidewalls



Laser
Facets



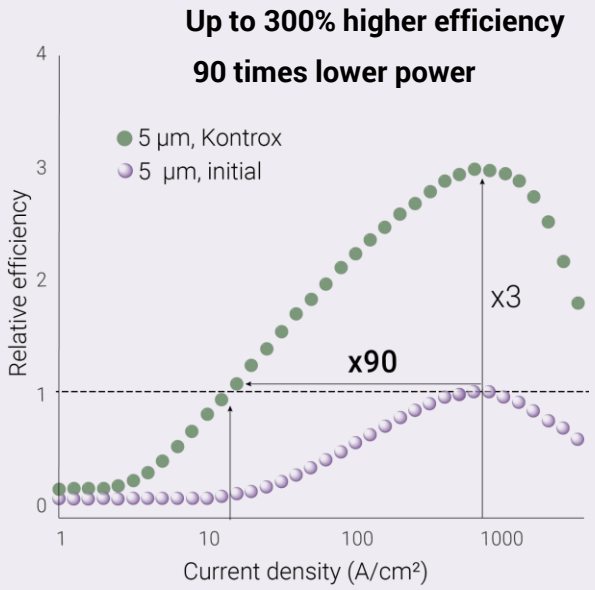
Transistor
based

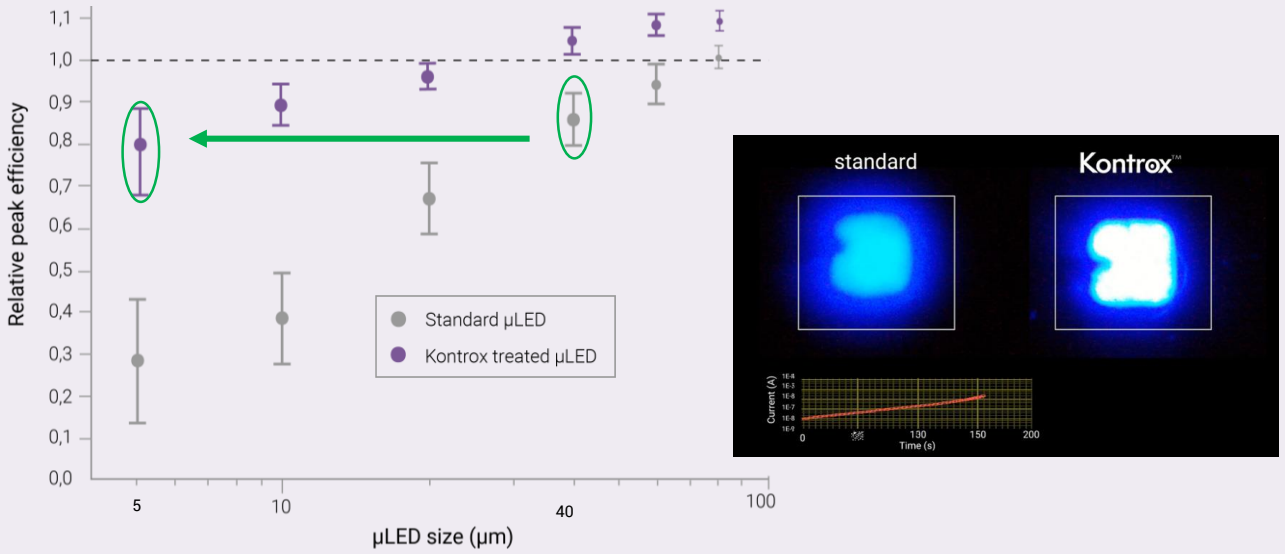


III-V
Substrates

Technology Proven with Several Industrial Players

Application case example: µLEDs





Important chip size reduction opportunity

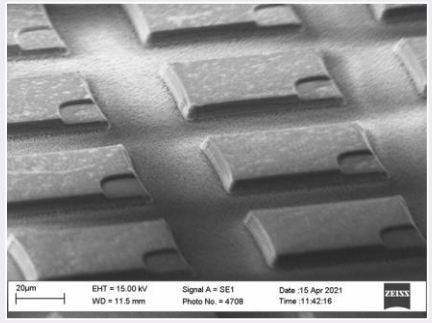
- 5µm chip can perform as good as a 40µm.
- **10 times more microLED chips/wafer**

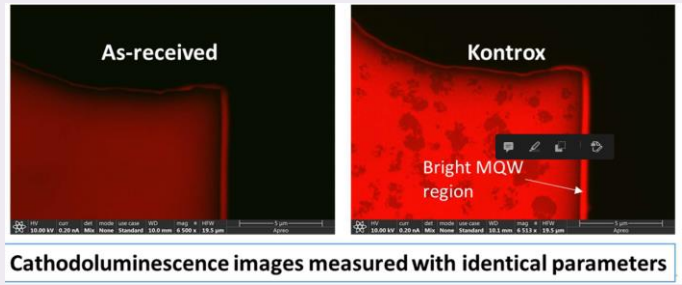
Reduction of production volumes / Costs

Less natural resources & electricity

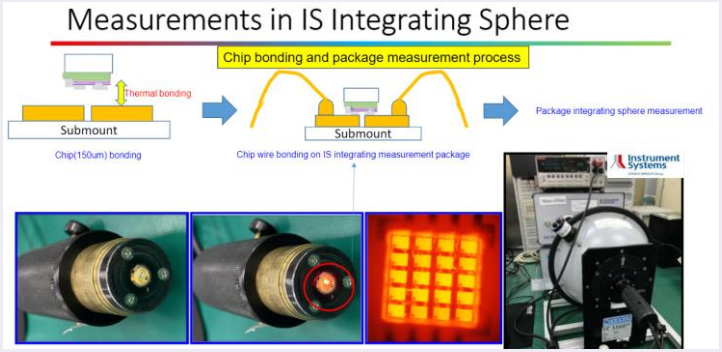
Less waste

Example of device improvements Kontrox vs Thin films

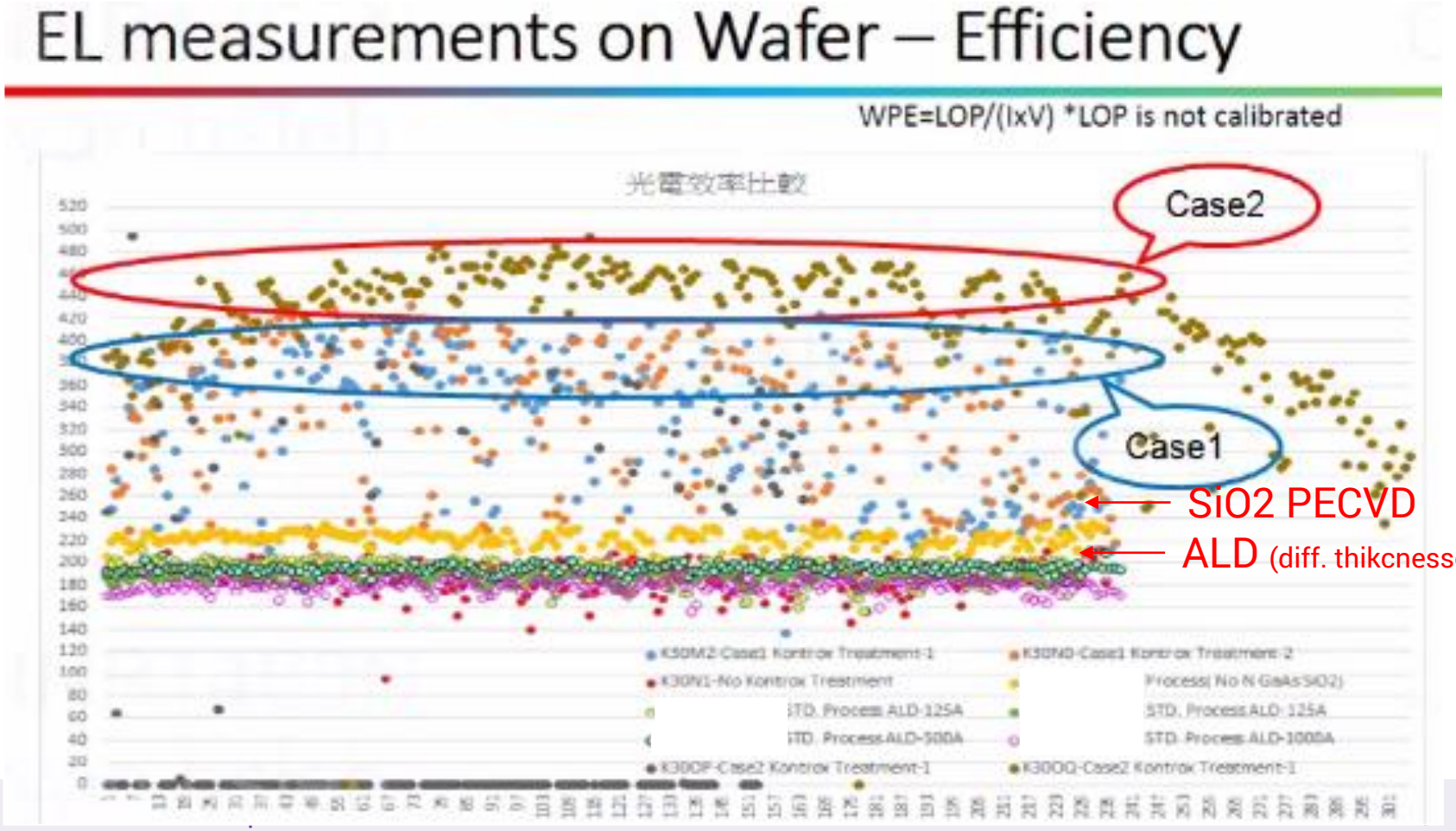




Cathodoluminescence images measured with identical parameters

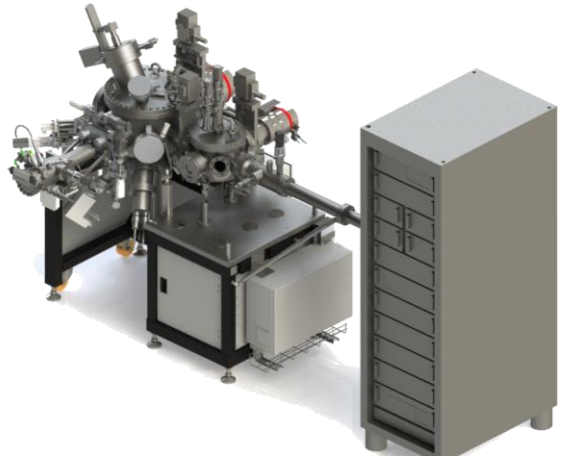


Mini/microLEDs in size 45x60µm. InGaAlP based.
2.5x wall plug efficiency improvements obtained by Kontrox vs ALD / CVD passivations



Kontrox for edge-emitting laser facets

Highest Quality / Cost-of-Ownership ratio available in the market

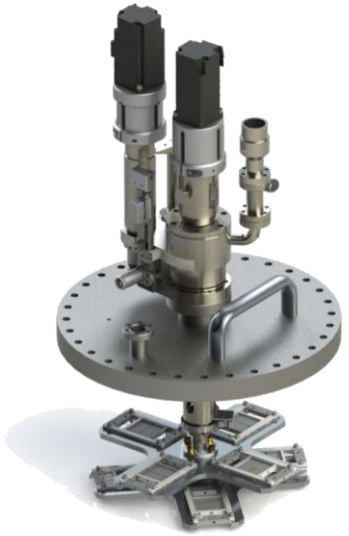


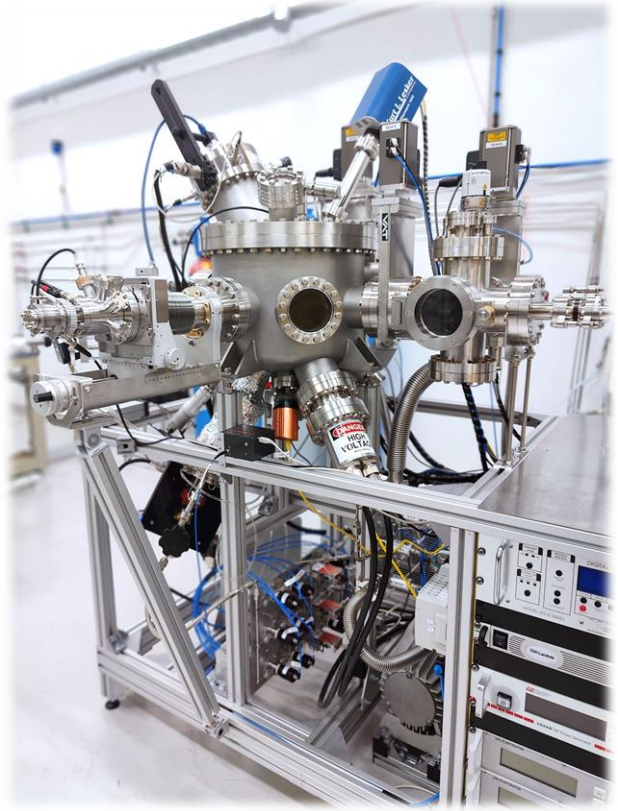
Kontrox vs existing methods:

Feature \ Method	a:Si coating, Si (industry standard)	E2 (cleaning in UHV)	Kontrox™
Quality	✓	✓✓✓	✓✓
Quality for Al-containing lasers	✓	✓✓	✓✓
Cost	$	$$$$	$$
Drawbacks	Defects not fully avoided	Very low throughput	New technology

Easy implementation: One single chamber machine

In-situ CLEANING → PASSIVATION → Facet Sealing (Si) *Optional

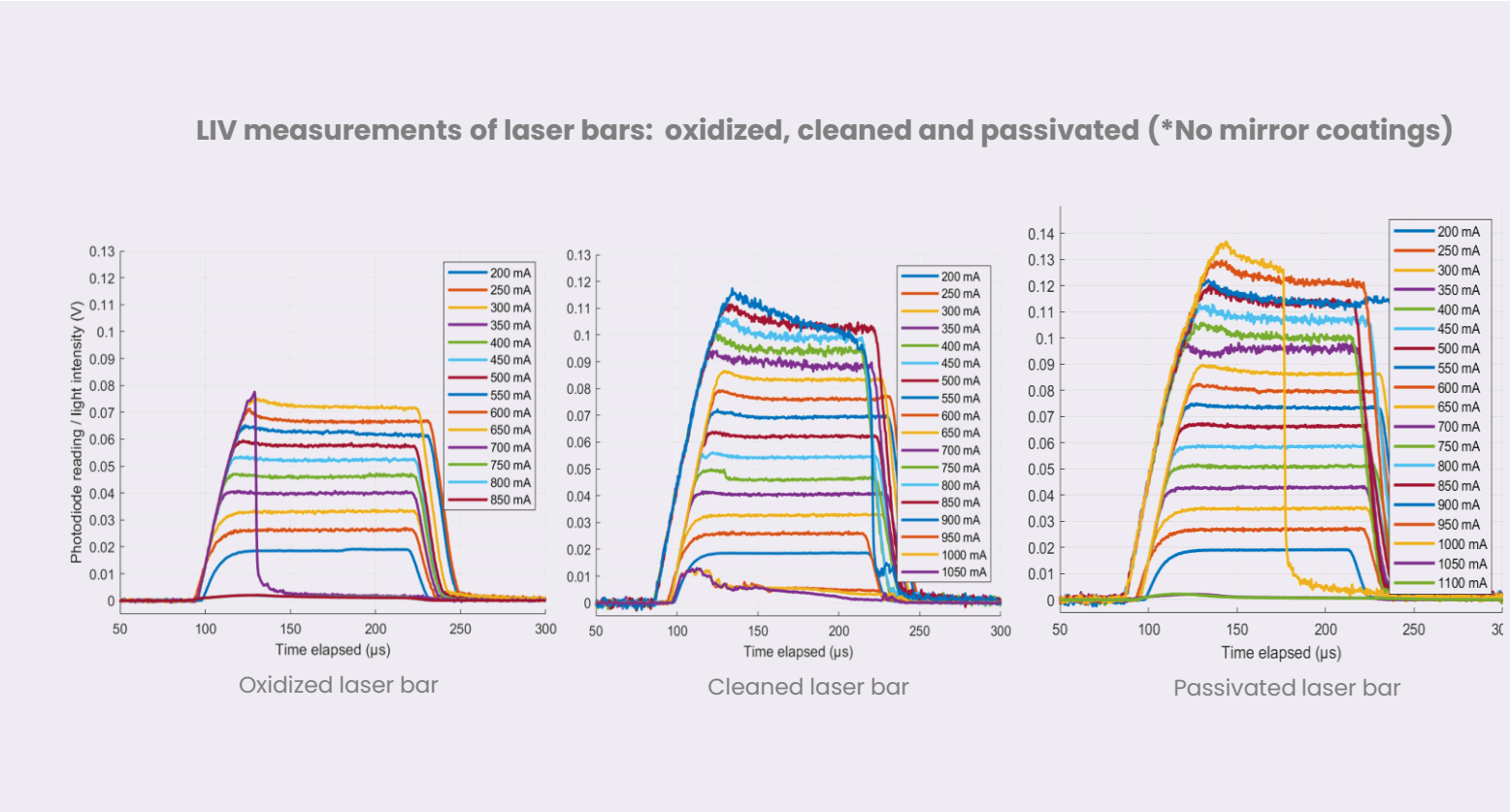


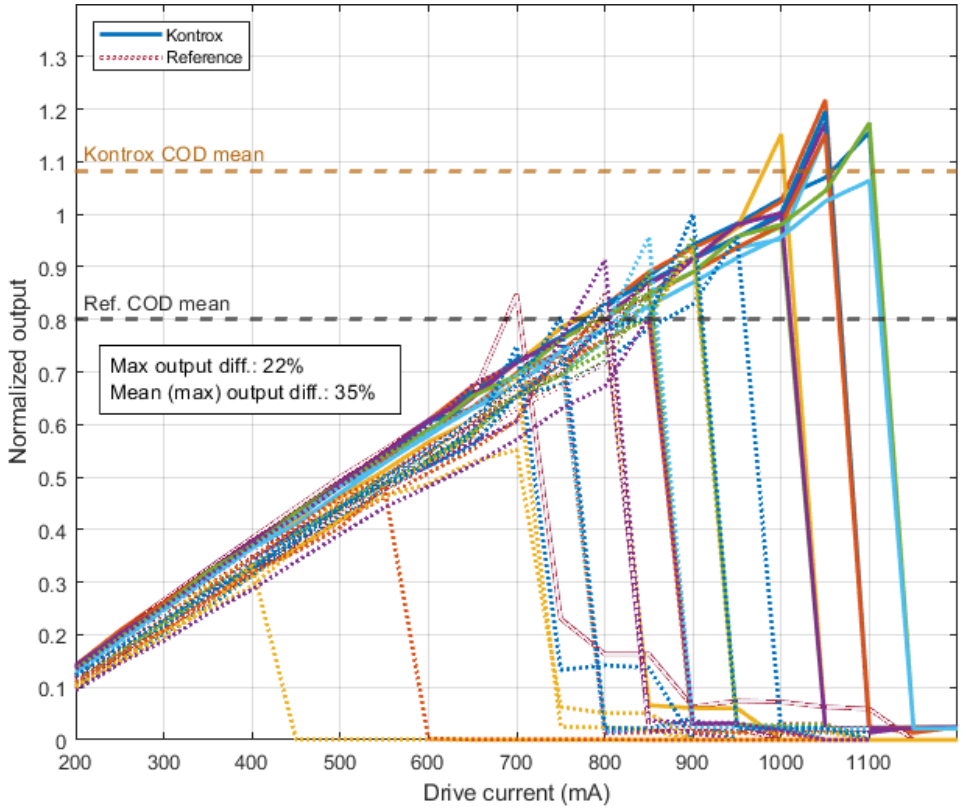


- In-situ cleaning + passivation of both facets
- Stable passivation (i.e. longtime exposure to air prior mirror coatings)
- Fully automated machine designed and built in the EU
- High throughput. Up to 1800 bars/ day

Example of COD improvements in edge-emitting laser facets

- Laser bars GaAs/AlGaAs based with Al:45%
- Wavelength 770nm

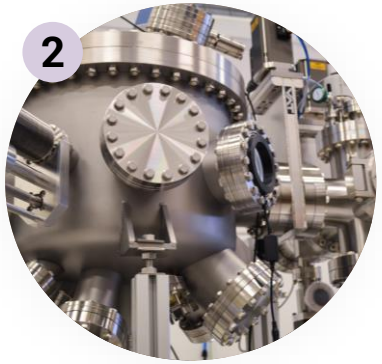




Business Model: Technology transfer and licensing

Tailored Turnkey KONTROX solutions to improve customer´s chip performance and manufacturing

Customized process
Process optimization for customer specific device/set of materials.



Equipment
From R&D to mass production

Freedom to operate
via license to Comptek´s IP portfolio

Proof of concept → **Technology optimization under Dev. Agreement** → **Tech transfer** → **Commercial implementation License agreement**

Thank You

In search of improved performance?

Comptek Solutions is your partner

For more information

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