

# Laser Edge Grinding of Thin Wafers with the Water Jet Guided Laser

Bernold Richerzhagen

Synova SA

# Outline

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# Why use of Thin wafers?

## Mechanical Flexibility

Smart cards  
Smart labels  
RFID devices



## Space Gain

Stacked memory chips  
Mobile computing

## Functional requirements

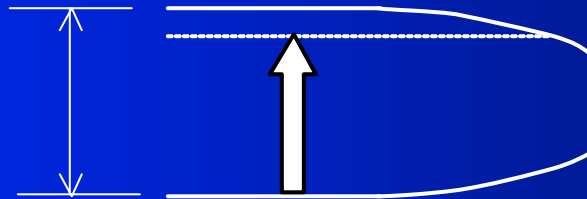
Diodes, thyristors



# Thin Wafer production

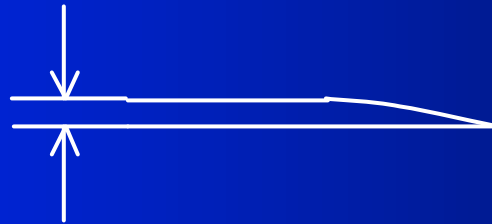
Wafer front side processes finished

Original thickness in front-end processing



Thinning (grinding + etching)

Remaining thickness  
(150 – 25 microns)



# Problem in Thin Wafer Production

Sharp sensitive edge with micro-cracks



Very critical wafer handling in subsequent processes



Wafer breakage up to 30% !



# Solution: Wafer Edge Grinding

Remove micro-cracks by edge grinding

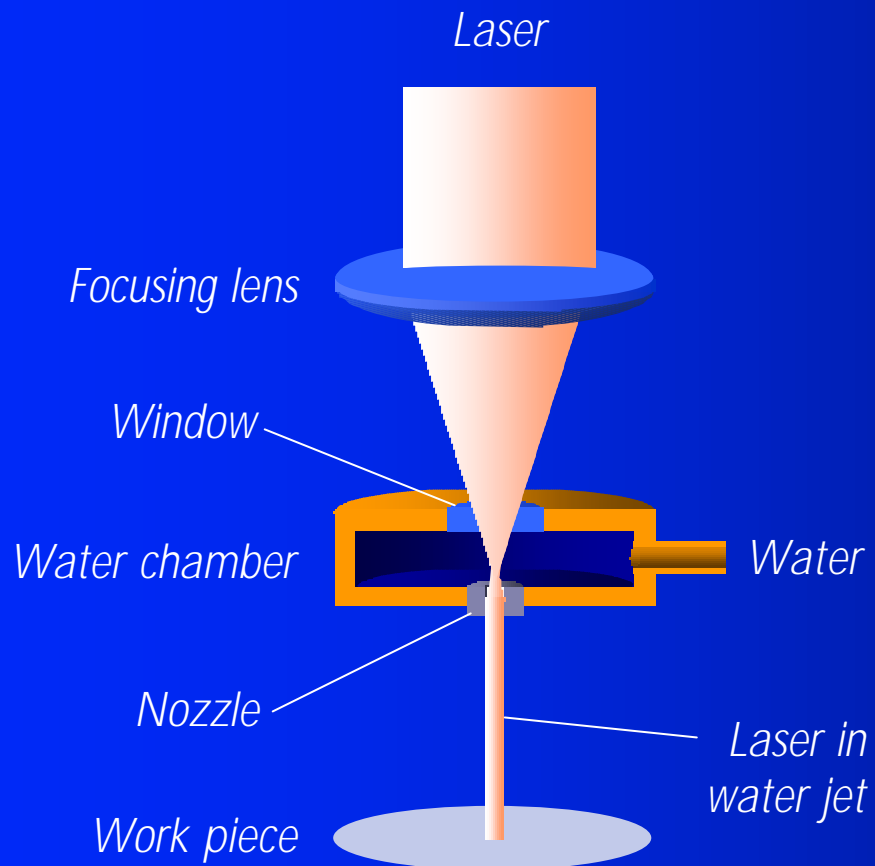
## Requirements to the Process :

- No thermal stress
- No mechanical stress
- Perfect edge quality
- No contamination
- High throughput
- Fully automatic
- "Intelligent" – detection of micro-cracks
- Minimum losses of wafer surface
- Edge grinding on tape and wafer support

Solution : Water-jet Guided Laser

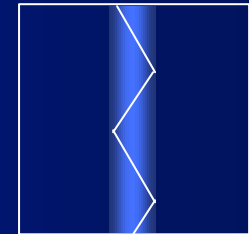


# The Water-Jet Guided Laser Principle

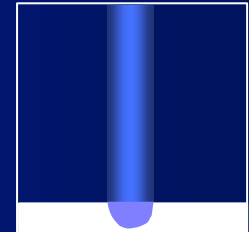


## Advantages:

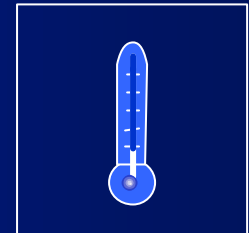
The water jet works as a fiber of variable length for guiding the laser beam



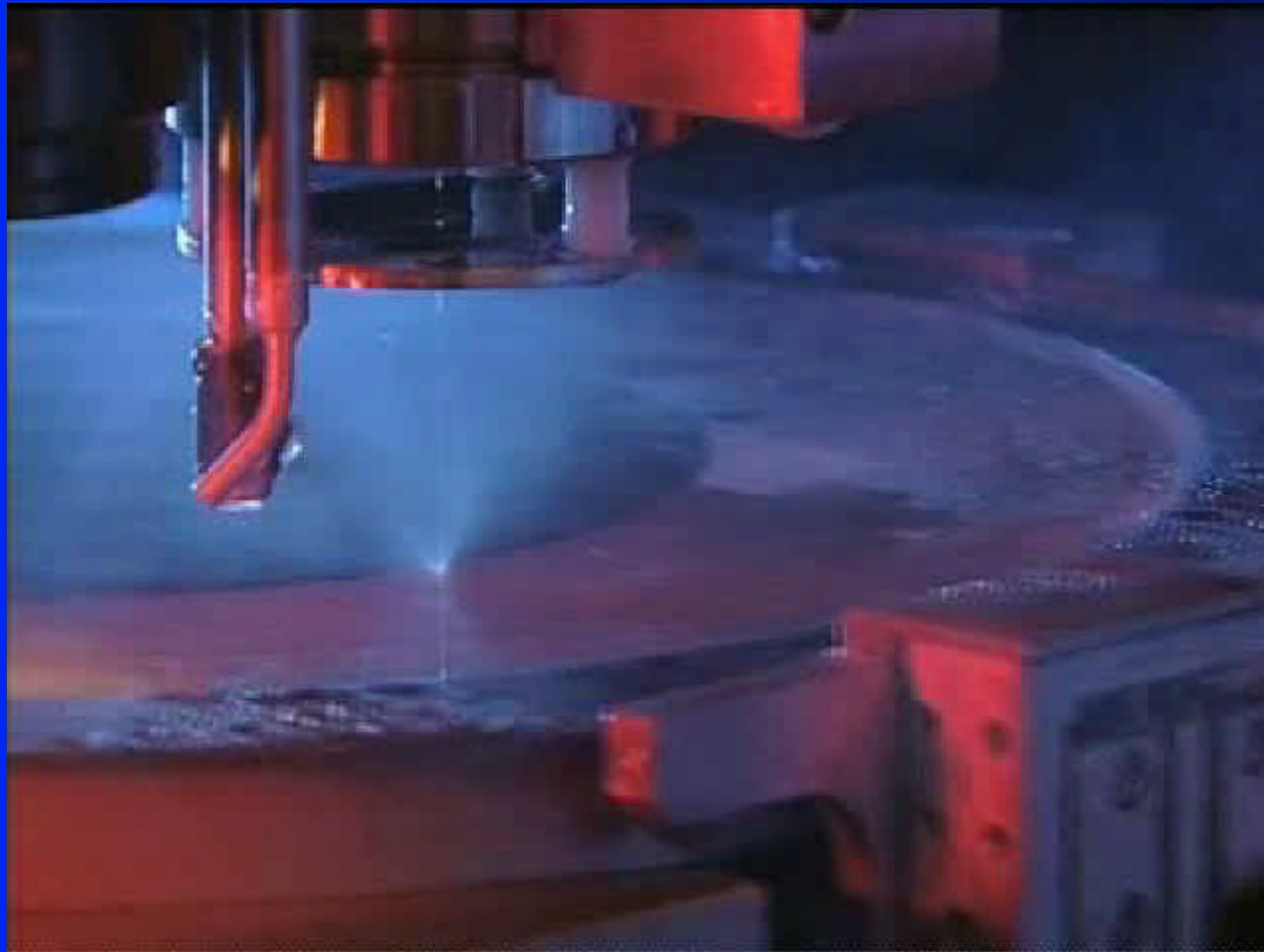
The water jet ejects the molten material and avoids any deposition



The water jet cools the work piece during laser ablation

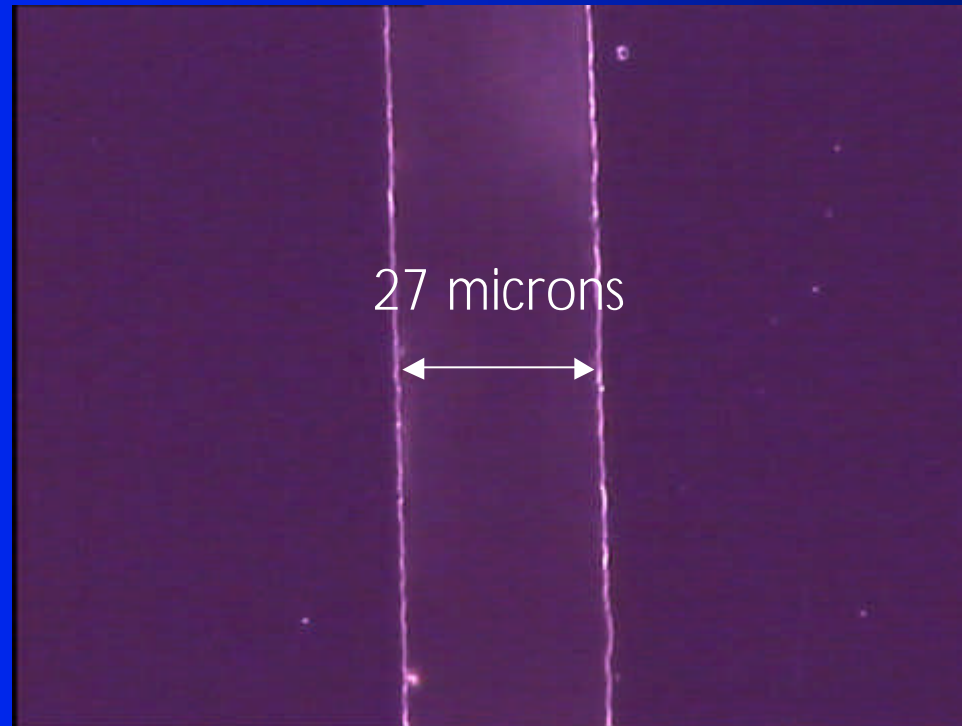


# Dicing by Laser-Microjet



# Cutting Quality by Laser-Microjet

Cutting Result without any cleaning:

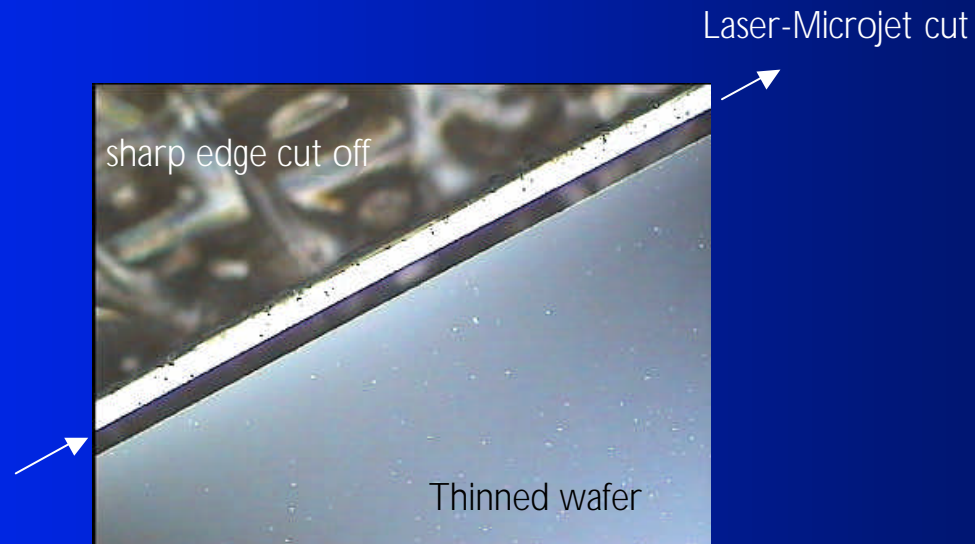


The wafer is protected 100% against any deposition thanks to a water film covering the wafer.



# Laser Edge Grinding Principle

The laser cuts off the sharp and brittle edge containing the micro cracks:



Reduce of wafer breakage to zero.



# Laser Edge Grinding System

## Main specifications:

- Wafers up to 8"
- Cassette-to-cassette
- Wafer edge detection
- Thin wafer handling
- Throughput 30 wafers/hour
- Clean room compatible



# Outlook

## Projects:

Edge grinding of GaAs

Detection of individual cracks and cutting out



Edge grinding of 12" wafers

Round edge grinding of wafers with tilted laser beam



# Conclusion

## Results:

*Problem:* Wafer breakage after thinning

*Solution:* Edge grinding for removal of cracks on thin wafer edges

*Ideal process:* Water jet guided laser

*Proven:* Heavy losses of thin wafers reduced to zero

*Available:* Fully automatic, field-proven tool, the "Laser Grinding System"

*True:* Return of Investment in 3 months!



# The Water Jet Guided Laser

