



# COHERENT IN LÜBECK

# THEMEN

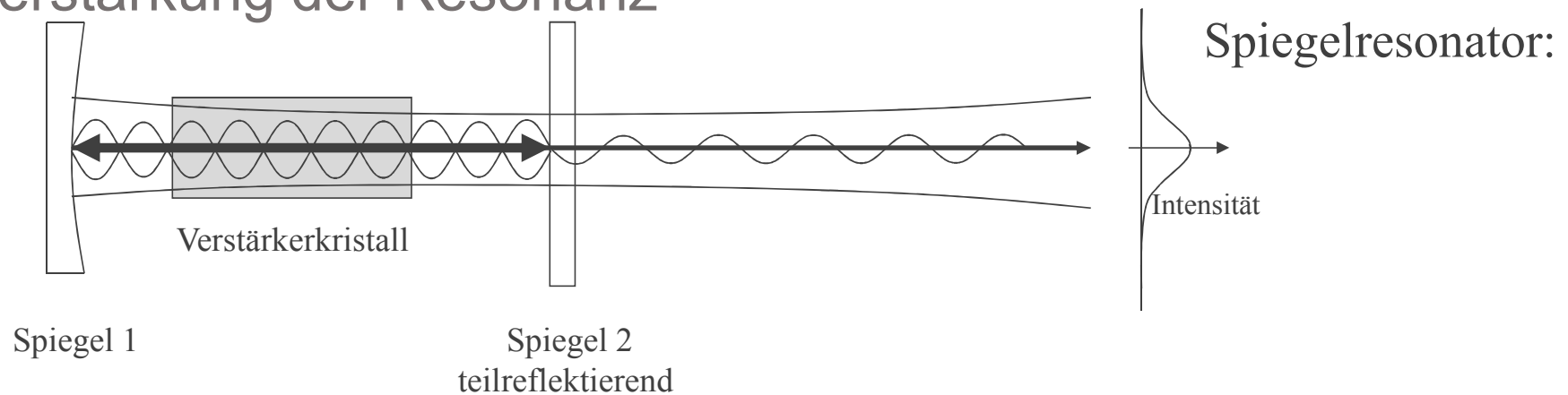
- Laser , eine besondere Lichtquelle
- Kurze Vorstellung des Konzerns und des Standorts
- Anwendungen von Lasern

# LASER, EINE BESONDERE LICHTQUELLE

- Ein Laser ist erst einmal schlichtweg eine Lichtquelle
- Weitere Lichtquellen z.B. Sonne, Leuchtstoffröhre, Autoscheinwerfer, LEDs - Wenn Sie direkt in die Sonne sehen, dann werden Sie von einer Lichtquelle mit  $3,8 * 10^{26} \text{ W}$  , das sind 26 Nullen vor dem (,)
- Besondere Eigenschaften:
  - Kohärentes Licht;
  - Spektral sehr schmalbandig
  - Lichtpulse – können sehr kurz sein – hohe Pulsenergie

# LASER, EINE BESONDERE LICHTQUELLE

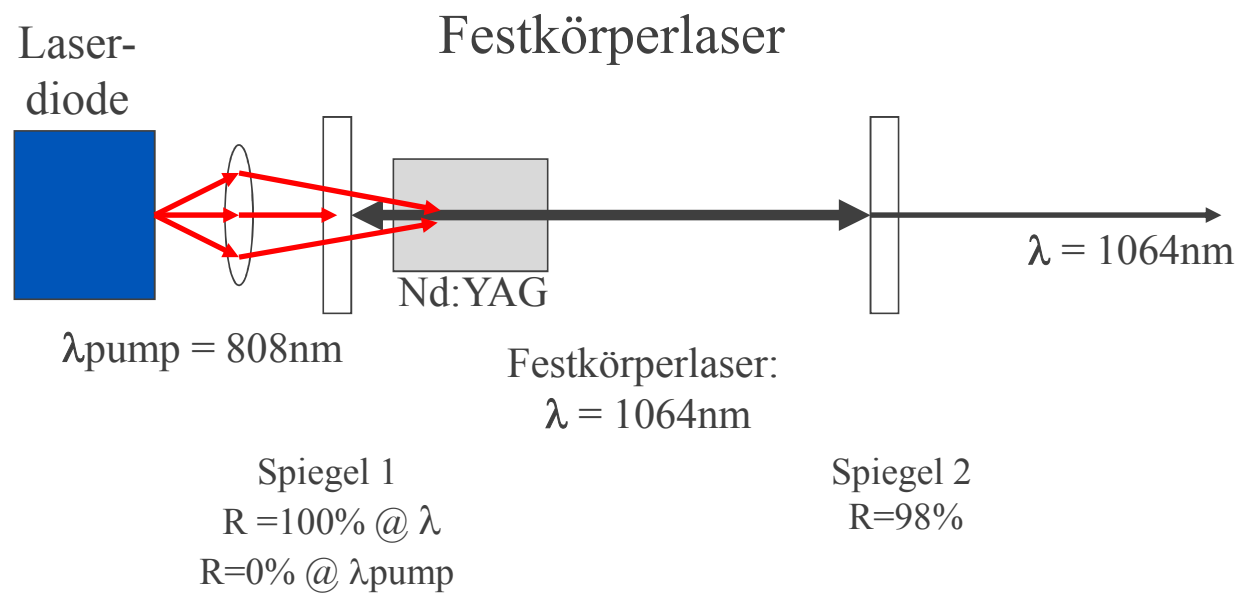
- Für einen Laser braucht man ganz grundsätzlich zwei essentielle Komponenten, einen Resonator und eine Verstärkung der Resonanz



Verstärkungsmedien sind z.B. Gase (HeNe, Argon, CO<sub>2</sub>) oder Festkörper (Kristalle Nd:YAG, Nd:YVO<sub>4</sub>, GaAs)

**LASER** = Light Amplification by Stimulated Emission of Radiation

# Coherent-Lübeck-Produkte: Diodengepumpte Festkörperlaser



Growth vs. Market



## Microelectronics

Consumer Goods  
Displays

1

SAM Position

## Materials Processing

Automotive,  
Machine Tool,  
Metal Cutting/Welding,  
Medical Device

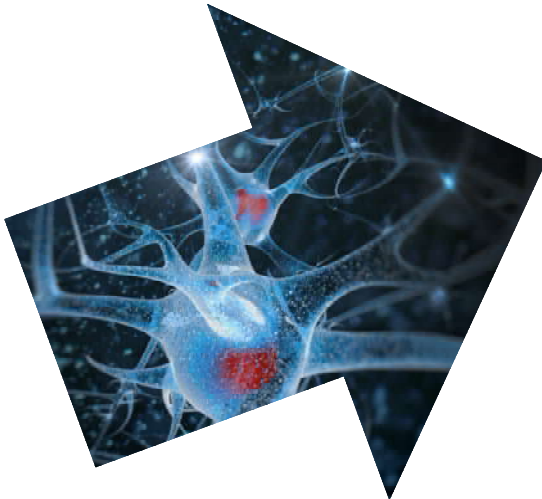


2-3

## OEM Components & Instrumentation

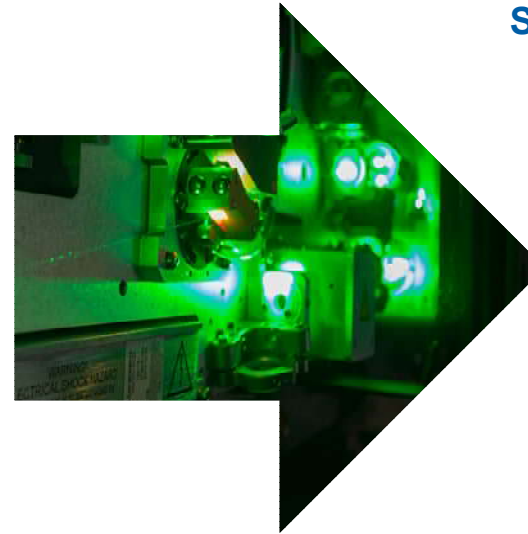
Bioinstrumentation  
Medical

1



## Scientific Research & Gov. Programs

Spectroscopy  
Advanced Imaging



1

# EXPANDING OUR GLOBAL SERVICE AND SUPPORT TO ENHANCE THE CUSTOMER EXPERIENCE



**20,000 Customers**



**160,000 Systems**



**30,000 Field Visits Annually**



**Service Team of over 550 People**

**Sales Team of over 300 People**

**Over 50 Sales & Service Locations**



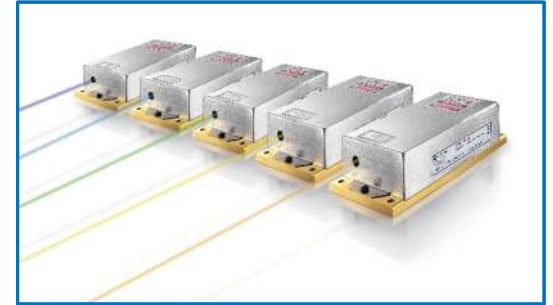
# COHERENT LUEBECK

- **The** Manufacture of Diode-Pumped Solid State Lasers
- Established 1986
- Total > 300 employees
- Factory “footprint” ~8.000 m<sup>2</sup>/ 86,000 sqf
- > 100,000 lasers installed
- High-volume, semi-automated, robot-assisted, clean room manufacturing
- PERMALIGN technology (soldering):  
“Applying electronics manufacturing to lasers”
- Automated burn-in and end-testing of every laser
- Ongoing non-destructive and destructive testing of lasers arbitrarily taken out of production
- Materials processing application laboratory
- Certifications: ISO 9001 (quality), ISO 14001 (environmental), OHSAS 18001 (safety), ISO 50.001 (energy management)





# COHERENT LUEBECK PRODUCTS



**Compass, OBIS LS, OBIS CORE LS, Sapphire**

cw DPSSL and OPSSL for Life Sciences: 458 to 594nm



**Flare, Helios**

short-pulsed (0.7-1.5 ns) IR, VIS, UV QS  
DPSSL for life sciences & materials processing

**AVIA LX, Matrix**

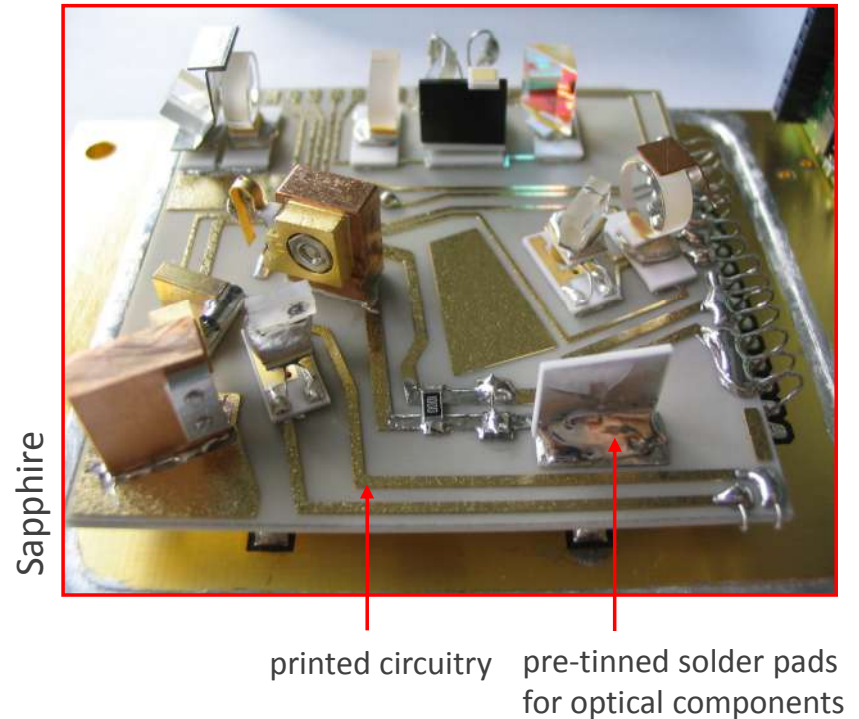
355/ 532/ 1064nm lasers  
for materials processing

**Paladin**

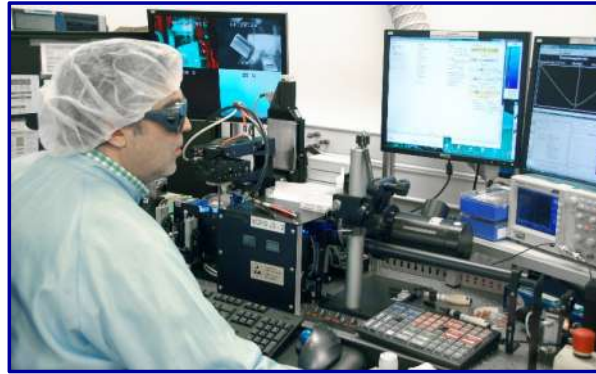
ps green & UV lasers for inspection  
and materials processing

# COHERENT'S PERMALIGN™ PROCESS

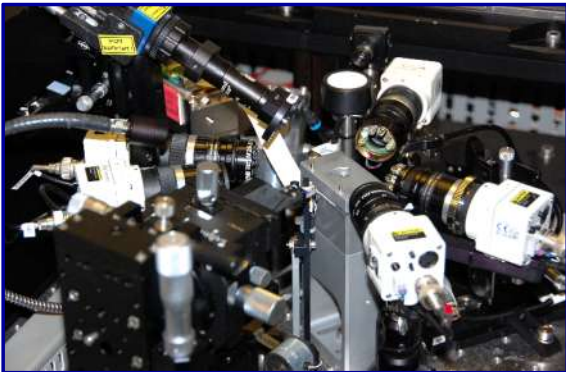
- Alignment-free: optimal & permanent
- No standard component holders needed: no metal mounts, screws, spring-constructs, etc.
- No thermally & mech. “active” components
- No crowded resonator: quality of manufacture, process control
- Allows for pick & place processing
- Unsurpassed thermal and mechanical stability
- Best laser beam parameters
- Lowest noise, highest power stability
- Best unit-to-unit consistency
- Best reliability



# COHERENT LUEBECK PRODUCTION



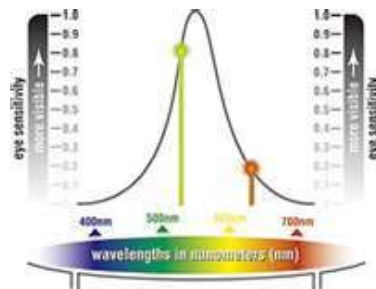
intensive end test  
of every laser



Kanban

clean room manufacture

# OEM & INSTRUMENTATION



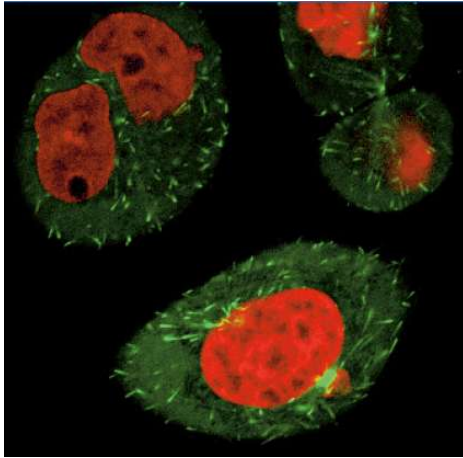
Low Cost Lasers  
Medical Diagnostics & Therapy  
Stable Business



>15% of Coherent revenue

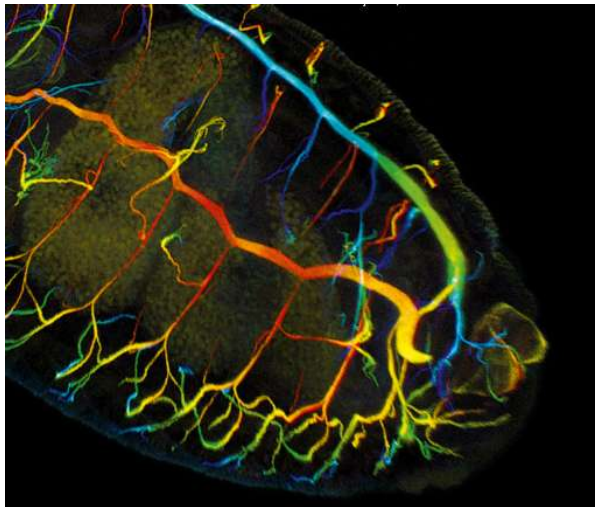
# CONFOCAL MICROSCOPY

source: Zeiss



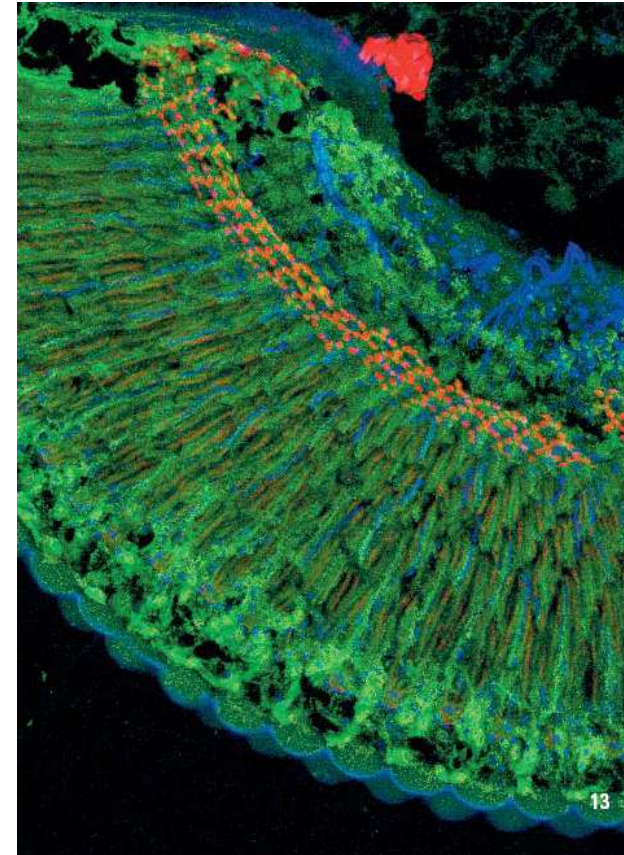
HeLa cells, fluorophores  
EGFP (green), mCherry  
(red)

source: Zeiss



Drosophila Embryo

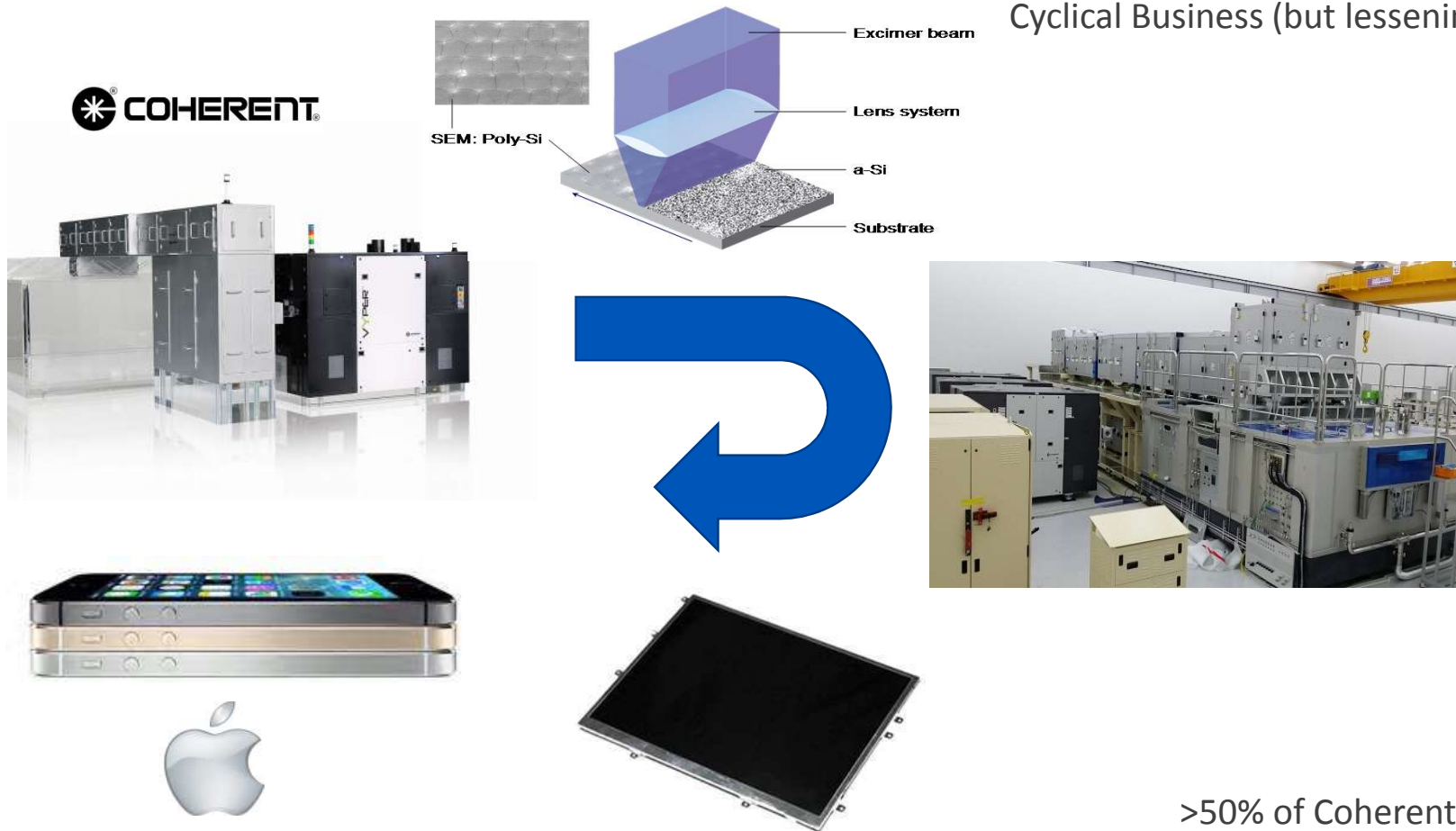
source: Leica



Drosophila melanogaster (eye section)

# MICRO-ELECTRONICS

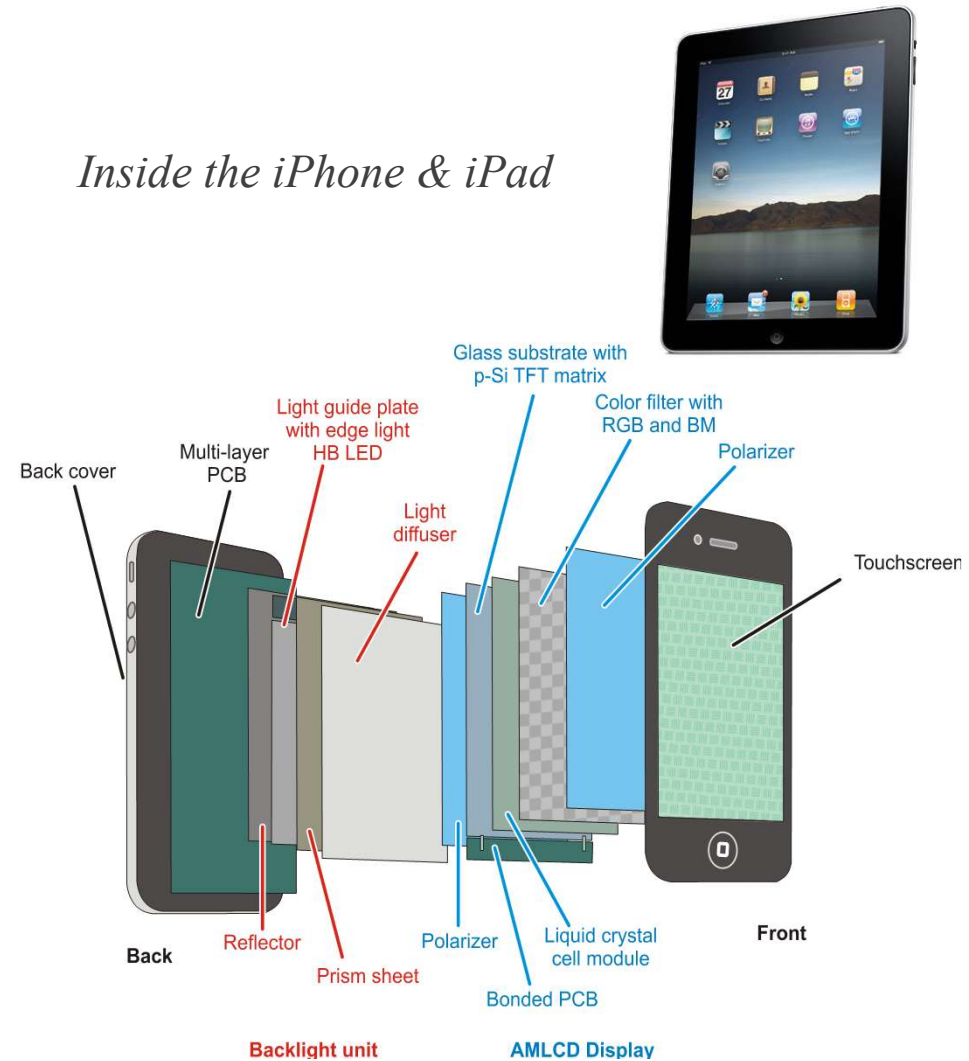
Consumer Electronics Volumes (B's of units)  
High Growth Markets  
Cyclical Business (but lessening)



# FPD Driven Laser Applications

- Foils / Film [reflector, prism, diffuser, polarizer]
  - Laser Cutting
- Glass Substrates
  - Conformal Glass Cutting
  - Laser Titling / Marking
  - Laser FRIT Welding (seal display)
- Light Guide Plate
  - Laser Engraving
- LED Lighting
  - Laser Scribing + Laser Lift Off
- Active Matrix TFT backplane
  - Laser Crystallization for poly-Si, LTPS
- Color Filter / OLED
  - Laser Induced Forward Transfer (LITI)
  - Laser Repair
- Touch screen Panel
  - Laser Direct Patterning of Electrodes
- *Back / Front Cover*
  - *Laser Drilling (microphone holes)*
  - *Laser Marking*
- *Multi Layer PCB*
  - *Laser Direct Imaging (LDI)*
  - *Via Hole Drilling*
- *Chip Set - Memory, DSP, RF Chips*
  - *Laser Lithography @45nm*
  - *Chip / Package Singulation*
  - *Laser Marking*
  - *Laser Bonding (ACF)*

## Inside the iPhone & iPad



# SEMICONDUCTOR APPLICATION

How to find the golf ball at >95% capture rate and no false count?

Sahara Desert



Siberia Tundra

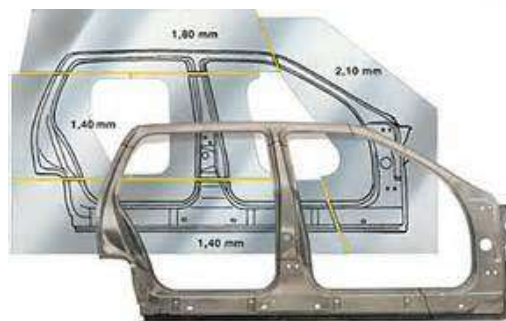
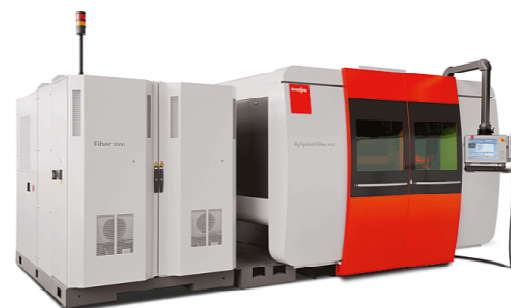




# MATERIALS PROCESSING



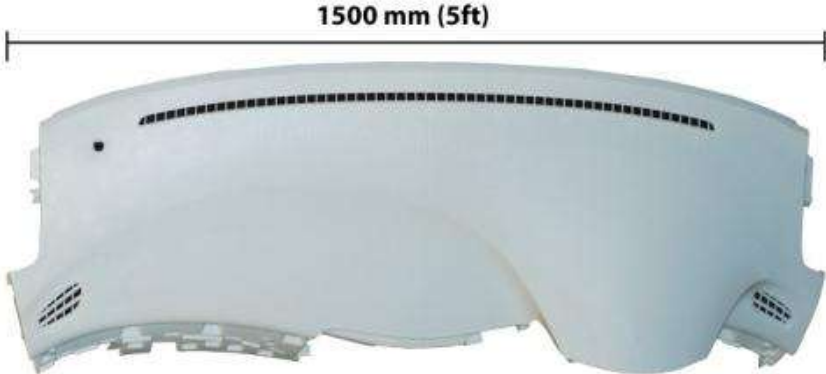
Cutting, Welding,  
Drilling & Heat Treating  
Precision & Speed  
Largest Laser Market



>30% of Coherent revenue

# MATRIX Line - Examples

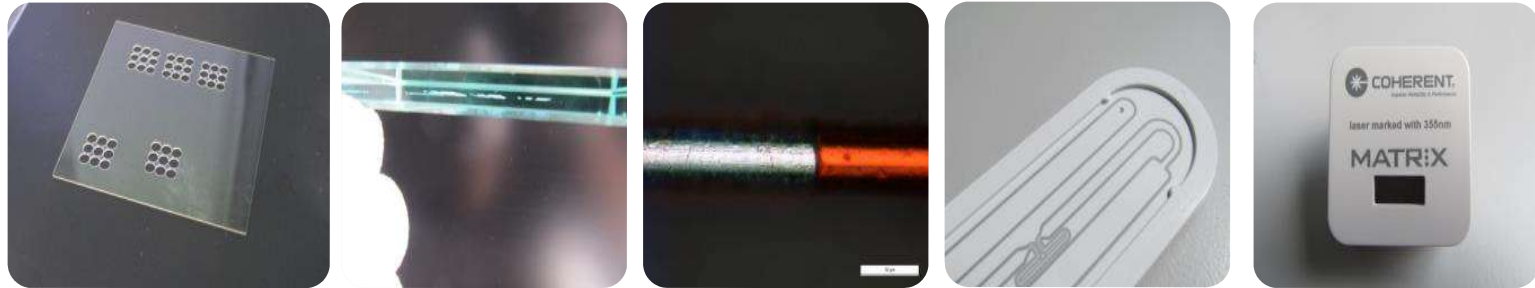
Additive Manufacturing – U  
Epoxy



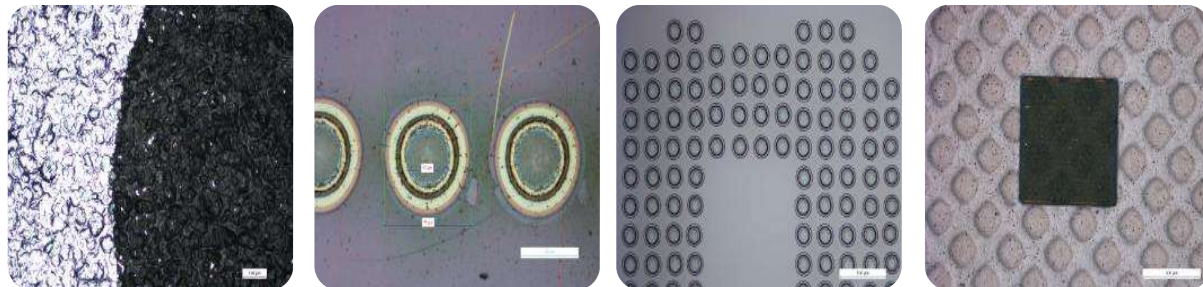
Marking Polymers



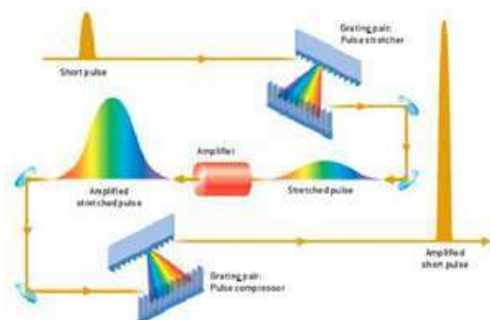
# APPLICATION EXAMPLES AND PROCESSING RESULTS



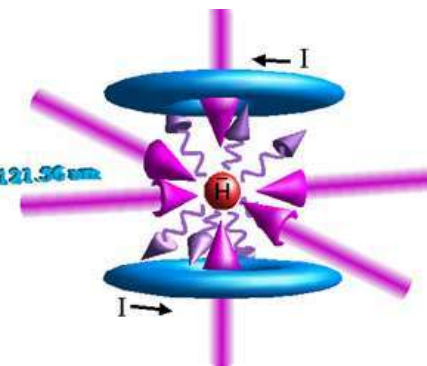
*and many other laser  
applications using  
MATRIX / Helios  
1064 / 532 / 355*



# SCIENTIFIC



Cool Science  
Inventing the Future  
Stable Business



5% of Coherent revenue