



Laser Micromachining Workshop

Salon EPMT

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Secretary-General, EPIC

Palexpo
Geneva, 7 juni 2012

EPIC : Mission

***EPIC*: owned and operated by its industry members**

**Promote Sustainable Growth for the
European Photonics Industry**

Implementation

- Working to increase the revenues of our members
 - Resources and financial support for prototype development and evaluations
 - Enhanced access to R&D funds
 - Reduced production costs
 - Creating new manufacturing infrastructure
 - Facilitating partnering
 - Vital business development services
 - Networking
 - Timely market and technology intelligence
 - Developing your customer base

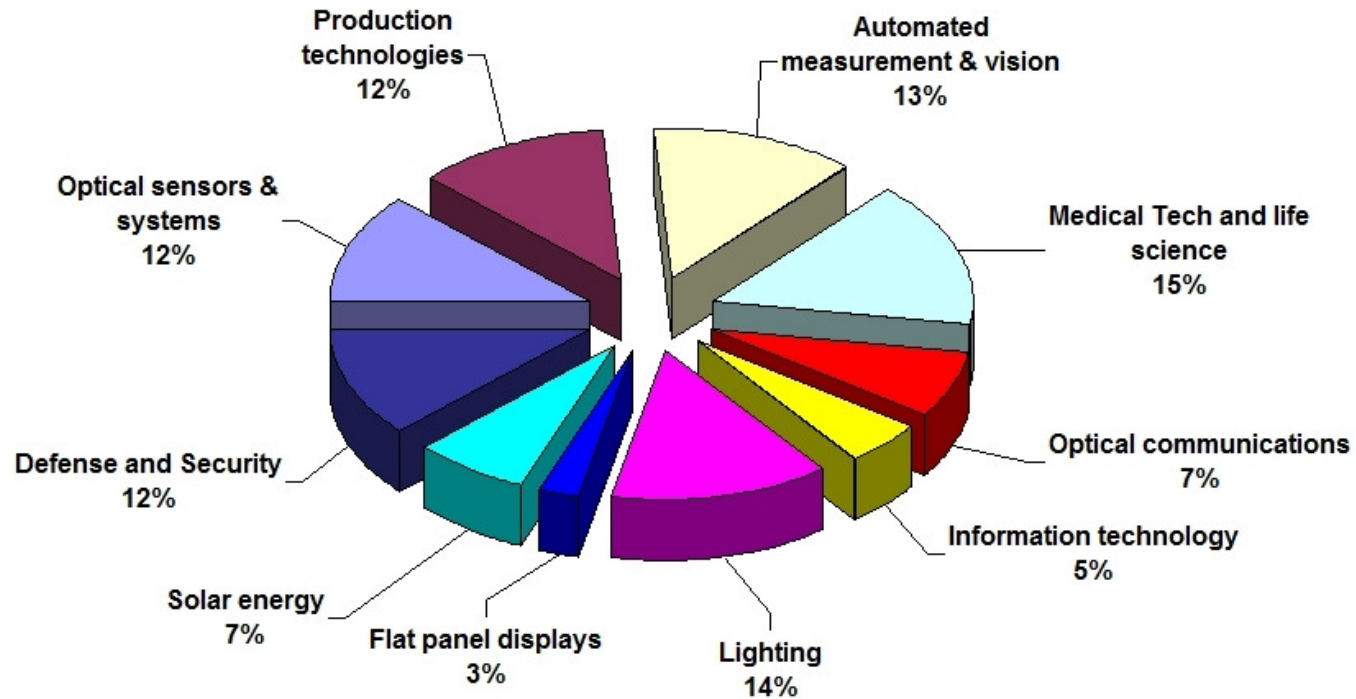
EPIC activities in 2011: an update

- The return on investment in 2011: EPIC membership is a revenue resource.
- EPIC members were paid 2.1 million euros net for participation in European projects, representing a 10 times return on membership fees paid (210 keuros)
- Nexpresso purchased prototype components from 3 EPIC members for 75 keuros and loaned components worth 66 keuros to member institutions.
- EPIC becomes a registered stakeholder in REACH process and starts working with ECHA
- Contributions to Horizon 2020 and the Photonics PPP (communications, lasers, lighting, sensor components and research: see the members' site)
- Individualized services to members: introductions & meetings with customers, bi-lateral business deals, creation of a photonics pole in Brittany
- Showcasing of EPIC members on EuroNews television

Photonics: a 62 billion euro business in 2010 & 2011

European Photonics Production by sector, 2010
 Total = 62.4 Billion euros

EPIC estimates that 350 000
 are employed in the Photonics
 Sector in the Europe zone.



Global Photonics

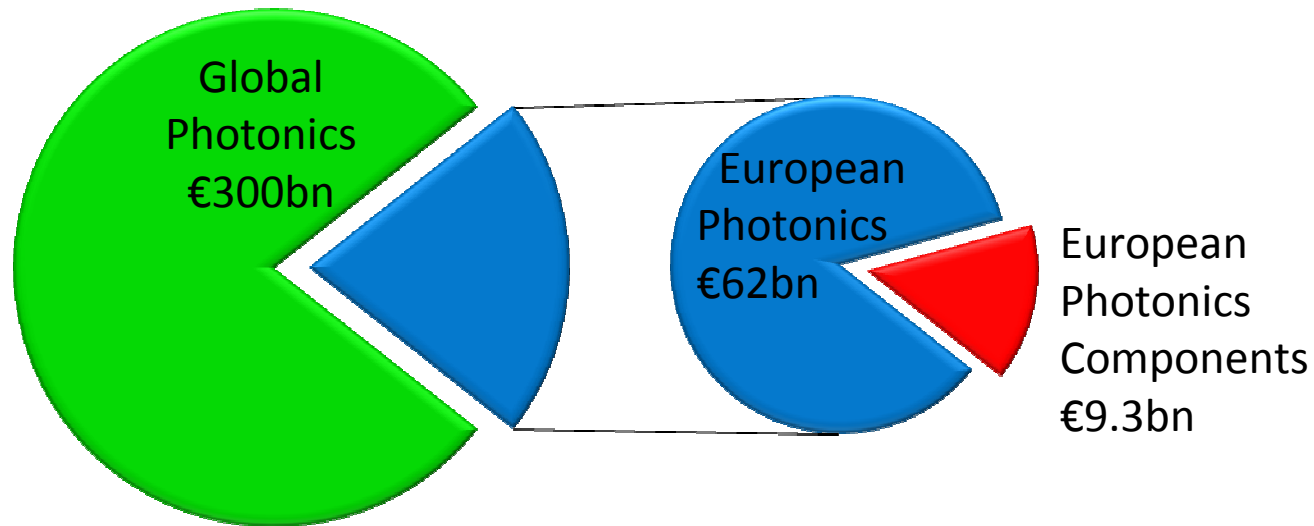
- Photonics is big - €300 billion now €480bn by 2015
- Europe is strong - 20% global market
- Photonics is becoming accepted – EU key enabling technology

Behind every photonics system/application is a
photonics component

- Challenges
 - Higher volumes required earlier at lower cost
 - Time to market decreasing
 - Volatility of demand in location & volume
- Can Europe maintain and grow position in components?

Photonic Components in Europe

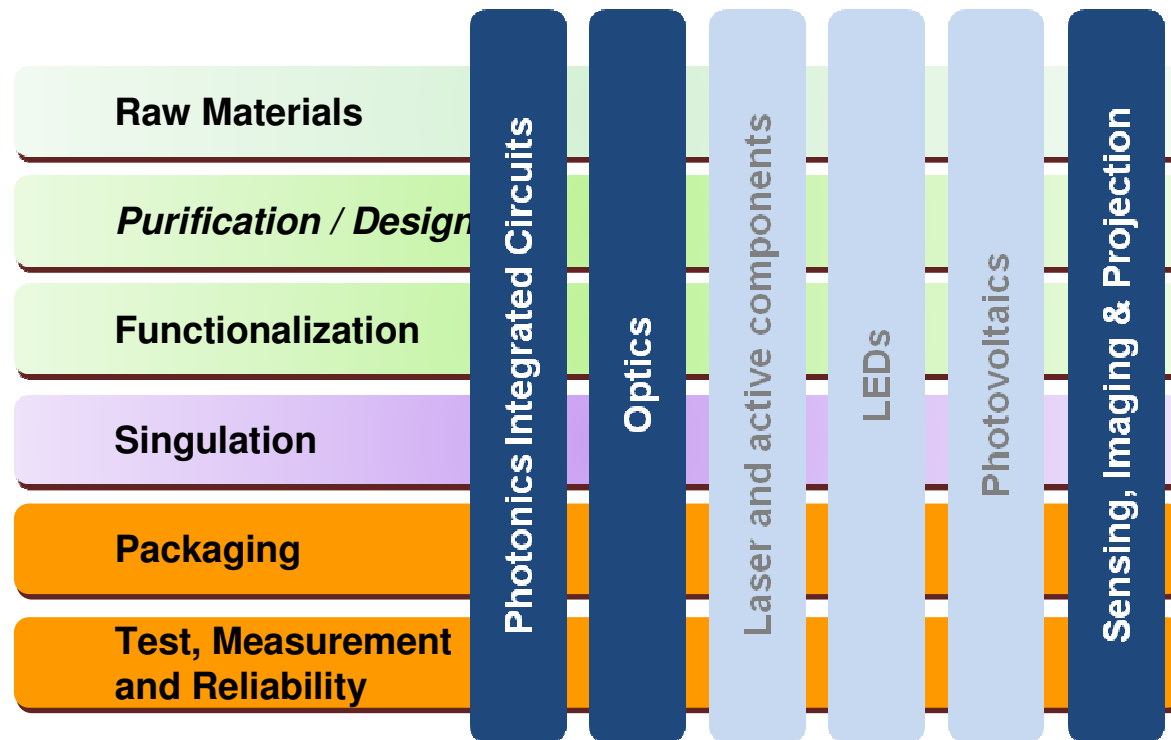
- How big is European component industry?



- €9.3bn includes
 - laser diodes, LEDs, image sensors, optics, glasses etc manufactured in Europe.

Opportunities

- Look at the process flow- raw material to finished component



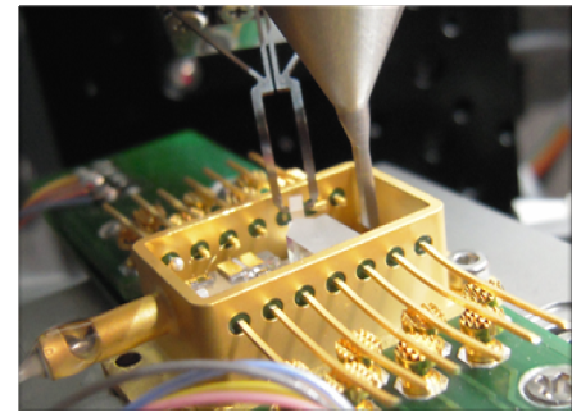
Focus on the manufacturing opportunities

Common themes/ windows of opportunity emerge



Integration & Automation

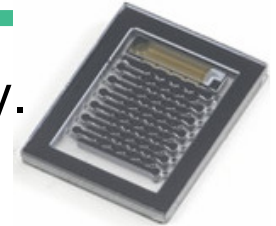
- More functionality without adding obstacles for the user
 - Improve delivered value without adding cost.
- Not just better performance, but *broader* performance
- Examples:
 - Photonic integrated circuits – more functions per device.
 - Adding functionally without adding cost = moving up the value chain
 - Make most of Eu strength in automated tooling
 - Makes labour costs less significant
 - Design for automation



Complexity is your friend

Wafer scale processes

- Wafer scale processing of 100's to 1000's device simultaneously.
 - Huge impact on electronics - similar impact on photonics.
 - Enables volume manufacturing, cost reduction and automation
 - Obvious in PICs, emerging in lenses, expect more ..
 - e.g wafer level PMT from Hamamatsu.
- But what about prototype volumes for market development
 - Sharing of prototype wafers- EPIKfab, Europractice etc
 - Sharing of fabs
 - Generic photonics foundries
 - Standard processes
- Don't neglect opportunities in fab equipment



Design for wafer fab.

Leverage existing processes

- CMOS industry invests €31 billion in new equipment annually
 - Constrains design freedom, but
 - Photonics needs to leverage this investment
- CMOS manufacture can be anywhere
 - In, or outside, Europe
- Electronics indicates substantial business in design & test
-
- Realising new designs is easier close to home



CMOS is your friend -use it wherever you can



csem centre suisse d'électronique
et de microtechnique

Center Central Switzerland
Alpnach

Rigi

Lucerne

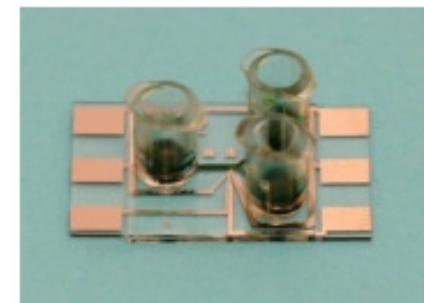
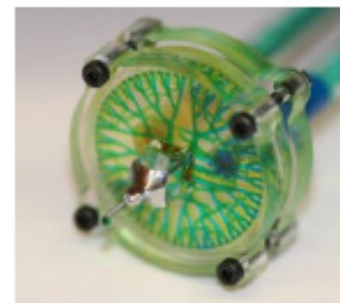
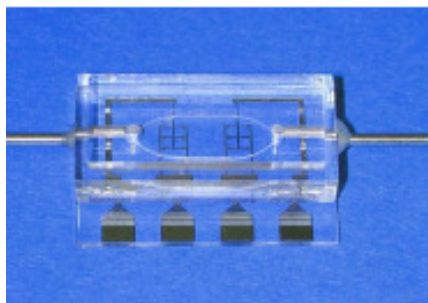
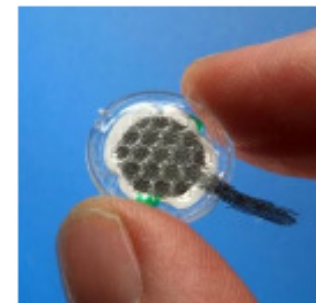
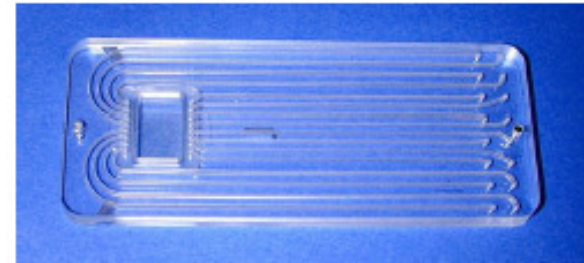
Laser Micromachining

- UV laser
 - 355 nm TruMark 2 W
 - 343 nm TruMicro 10 W (April 2012)
- Cutting, drilling, ablation, marking
- Large variety of materials
- High design freedom
 - Not just rectangular “dicing”
 - 2Dplus by local ablation



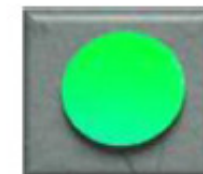
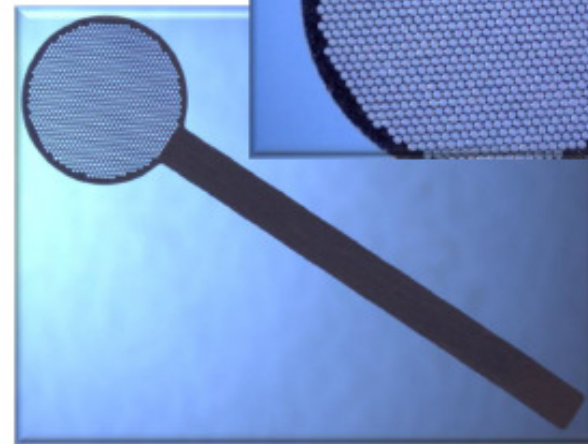
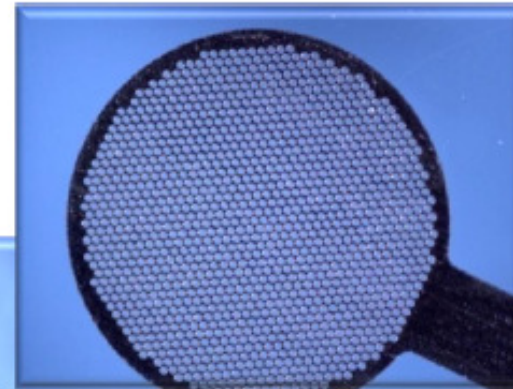
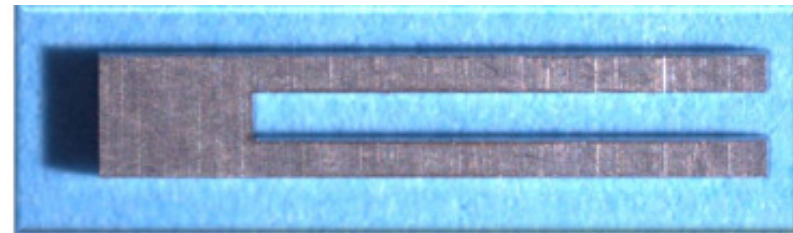
Laser machining of glass and ceramics

- Microstructuring
 - Micromilling
 - Laser cutting
 - Embossing or casting
 - Lithography
- Sealing
 - Lamination, thermal bonding, hybrid bonding, adhesives
- Integration of Sensors/Actuators
 - Microstructured gaskets, hybrid bonding, adhesives, flip chip



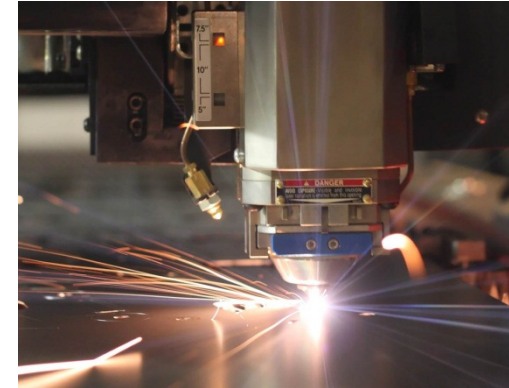
Metals

- Example: Steel
- Example: Electrode
 - 90 um holes
 - Contours
 - Pt, Pd, Ti, W, Ni, Cu-Ni-Zn, ...

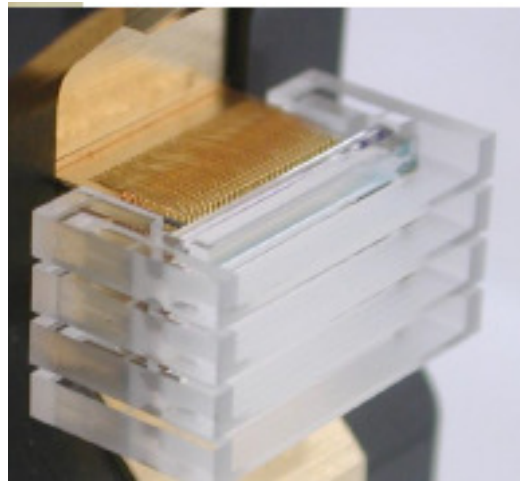


Direct diode laser processing

- Development and fabrication of high-power laser diode laser modules with optical powers in excess of 100 W
- Semiautomated optical assembly (alignment and fixation of over 40 microoptical elements)
- Route to full automation available



150 Watt CW
laser diode stack
with micro optics



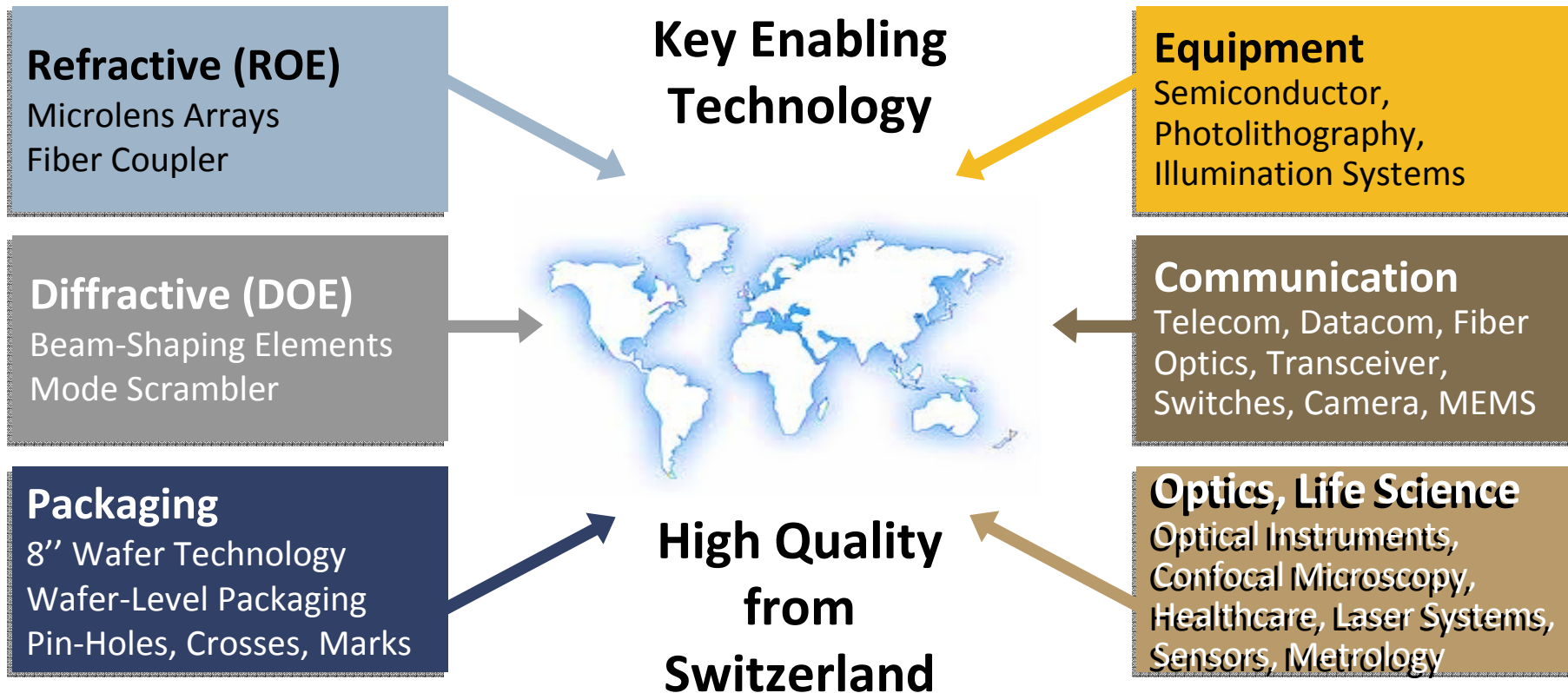
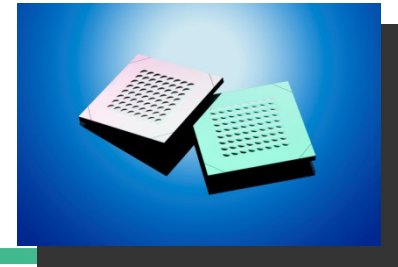
centre suisse d'électronique
et de microtechnique

CSEM Contacts

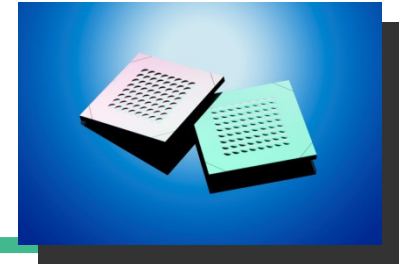
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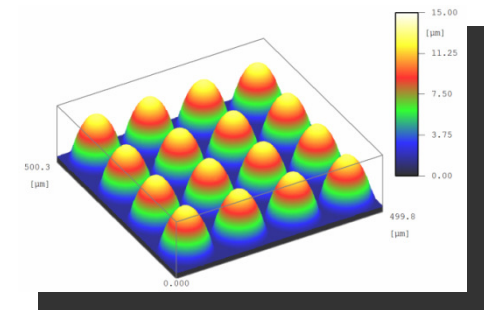
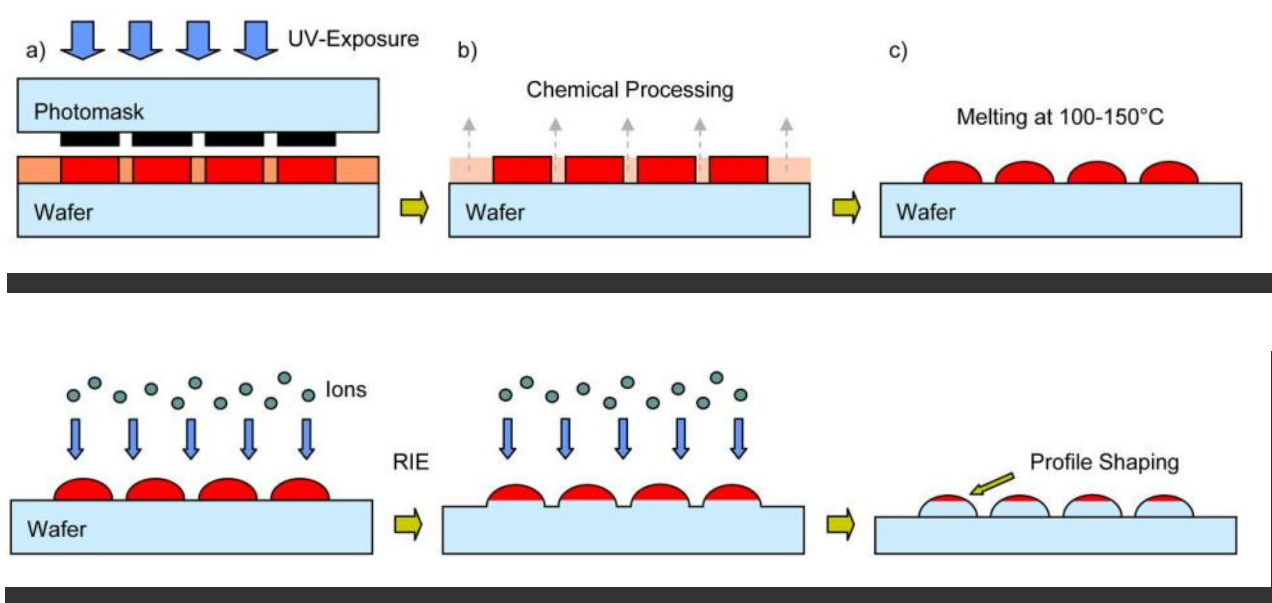
SUSS MicroOptics, Neuchâtel



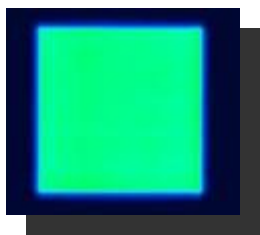
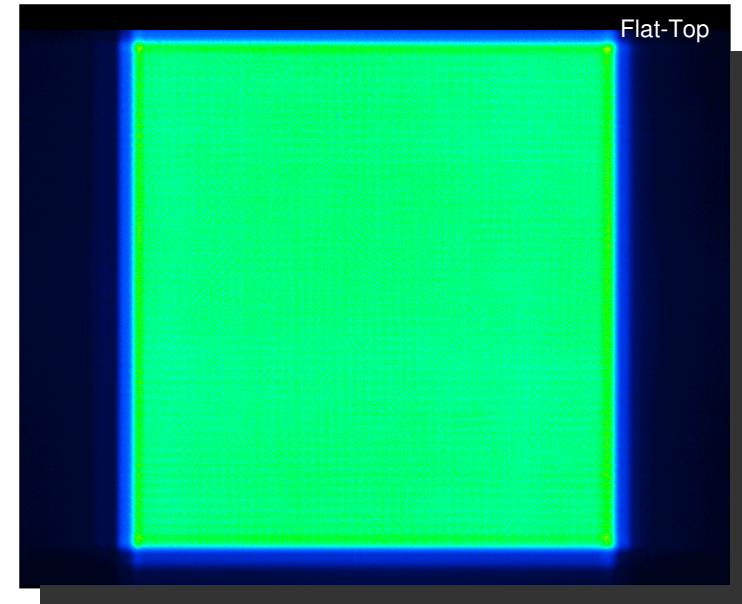
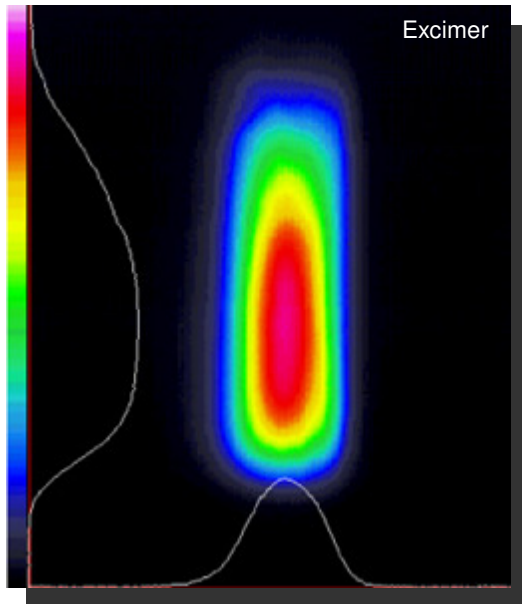
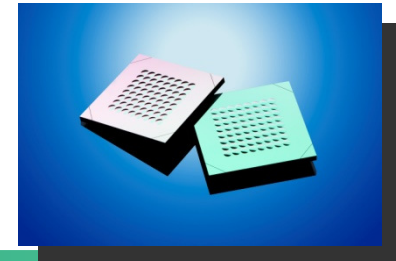
Wafer-scale manufacturing



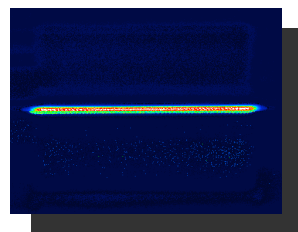
8'' Wafer technology: resist coating, lithography, reactive ion etching (RIE), deposition, sputtering and lift-off



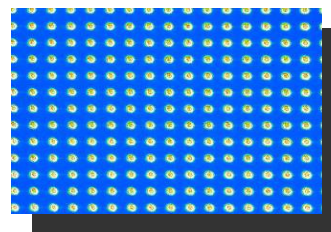
Diffractive optical elements for laser beam shaping



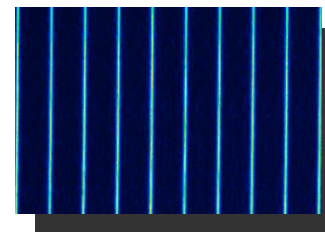
Flat-Top (2D)



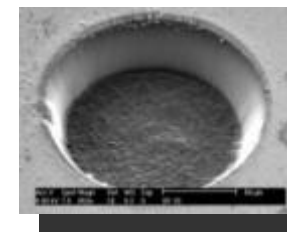
Flat-Top (1D)



Spot-Generator



Line-Generator



Ablation

Contacts at SUSS MicroOptics

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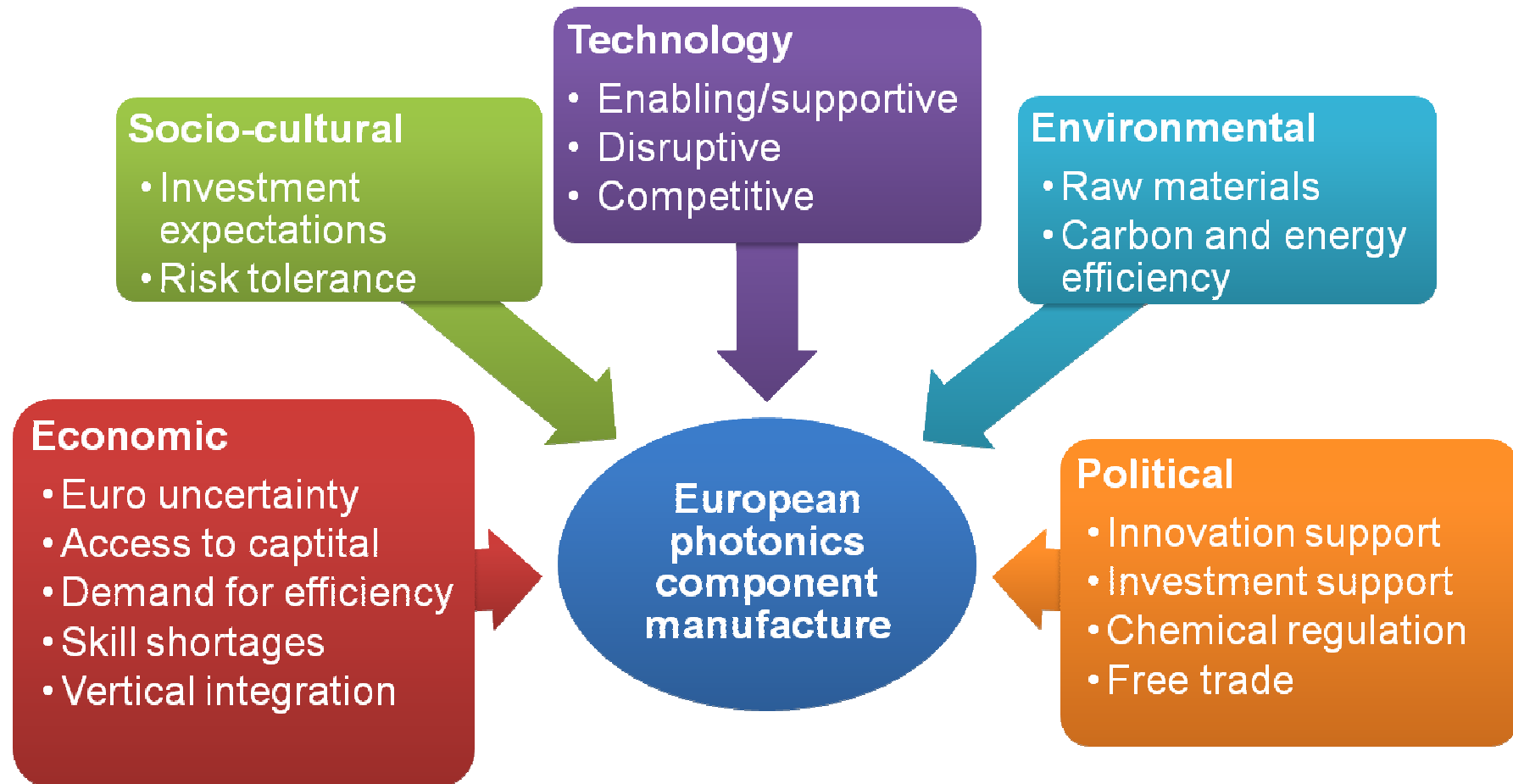
Proximity & globalisation



- Photonics is an international market place
- European component suppliers are born exporting
 - Aid to international growth,
- But
 - Physical distance between supplier and customer has a big impact on supply chains
 - Good if your customer is a high value machine tool developer in EU
 - But what if your customer is in Asia?
- Think international for investment as well as markets and suppliers.

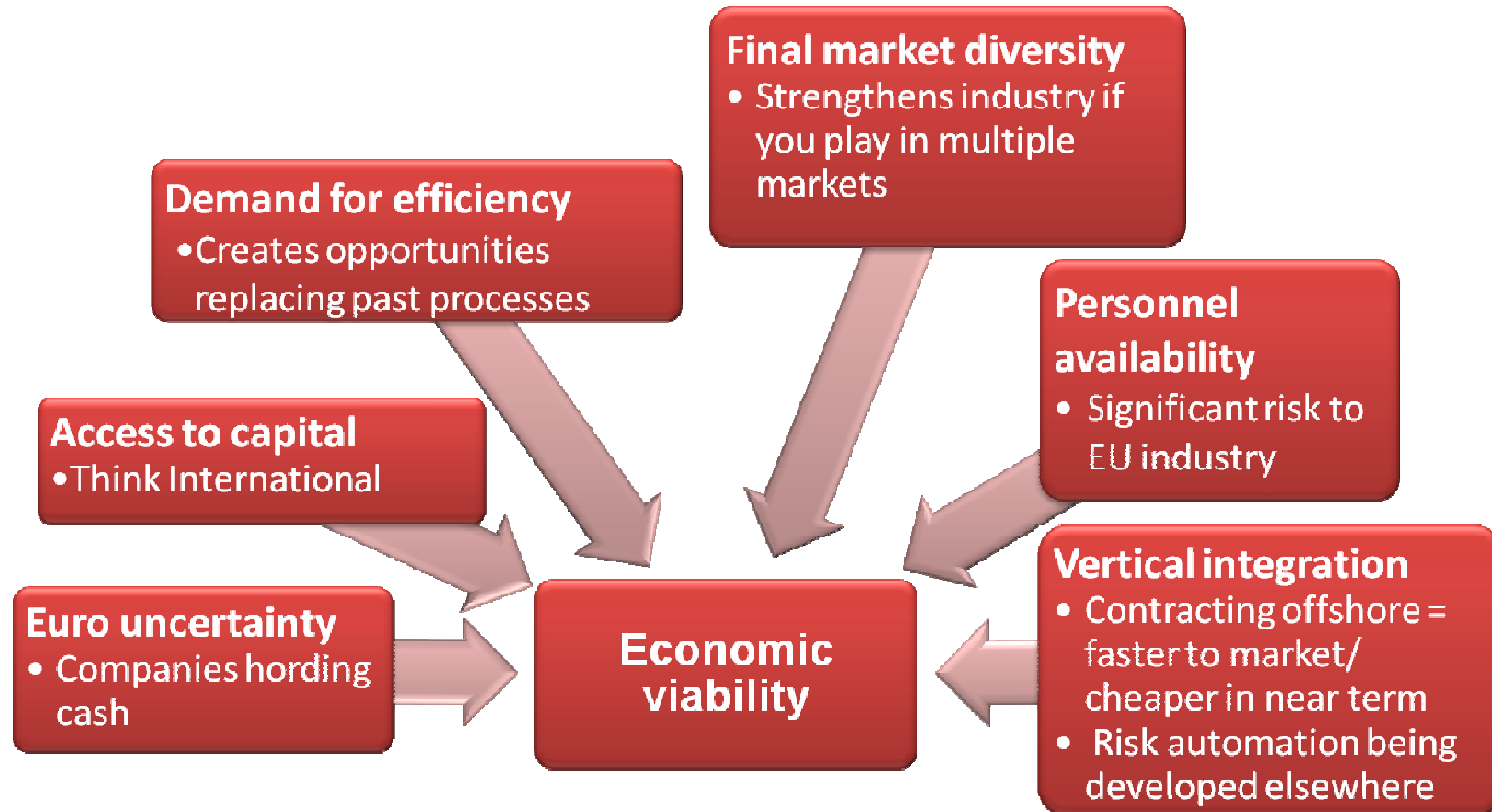
Don't neglect the profits in manufacturing tooling

External influence on opportunities



Don't ignore outside influence

Economic Factors



Macro-economics increasing impact as industry grows

EU Project Support

- Commission-funded projects are a victim of their own success:
 - One in ten chance of funding
 - Only some of the very best proposals are funded
- Intellectual Property
 - Results and technologies are shared
- Commercial exploitation is often far in the future
- Significant focus, effort and time are required for proposal preparation

EU Project Support

- Consortium
 - It could be the basis for commercial activities continued after the project
- Business Opportunity
 - The project is an excellent way to meet and work with new business partners in your value chain
- Our advice
 - Only participate in proposals where you can identify a direct business interest
 - Priority to preparing a winning proposal: total commitment

Objective ICT-2013.3.2

Application-specific photonic devices

- Lasers for industrial processing: Ultra-short (< 1 ps) pulsed laser sources with average output power (>200 W) and high repetition rate for high speed surface processing or cutting at micro/nanometre precision. Activities may include the necessary optical elements for beam steering and manipulation.
- Date : April 16, 2013
- Type : STREP
- Amount : 38 million € to be divided between STREP and IP

FoF.NMP.2013-11 Manufacturing of highly miniaturised components

- **Technical content/scope:** Miniaturisation has been an increasing trend in the last 15 years because of the drive for minimisation of energy and materials use in manufacturing processes, the increased need for redundancy, the requirements of faster and more energy-efficient devices, and the enhanced functionalities (such as selectivity and sensitivity).
- Micro-fabrication techniques are widely exploited by the semiconductor industry, which has invented many micro- and nano-scale manufacturing methods. These methods could be regarded, in general, as potential techniques for the miniaturisation of any component. However, they are mostly addressing a particular class of materials and 2D surfaces with specific features, and are highly sophisticated and expensive (high cost of ownership).
- Date: Not specified
- Type : STREP SME-dominated collaborative research project
- Amount : Not specified

FoF.NMP.2013-6. Mini-factories for customised products using local flexible production

- Mini-factories, addressing adaptation to customer needs at or near the point of sales or use, will be characterised by fast ramp-up, small footprint and reusability, and will be easy to handle and to set-up. Production systems should also include related new technologies for supply chain management, product distribution and direct end-user interaction.
- Research activities should focus on some of the following areas:
 - Scale reduction and increased flexibility of production systems in order to satisfy the special requirements of the local flexible mini-production units,
 - Adaptive control and automation systems for local flexible production with high customisation capabilities, where manufacturing operations and sequences need to accommodate to the highly unpredictable customer demands.
 - New engineering solutions, including integrated CAD-CAM, able to automatically adapt product features to specific customer demands and accordingly configure processes and machines for local production.
- Date: Not specified
- Type: STREP Demo project
- Amount : not specified

References from EPIC

- State of the LED Industry, 2012, to be published July 2012
- LED Manufacturing Technologies, 2012, to be published June 2012
- Manufacture of Photonic Components, published February 2012
- LED FAB Database, 2012, to be published: August 2012
- Building Biophotonics Business, workshop on October 25, 2012
 - Register now to assure your place. Report in February 2013

Contact EPIC to get your copy

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