Opportunities in Photonics Component Manufacturing in Europe

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Outline

Context and component market size
Definitions
Overall trends ....in detail
External factors
Context

• 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?
  • Do these trends really matter?
The sum of many parts

• How big is European component industry?

- €9.3bn includes
  • laser diodes, LEDs, image sensors, optics, glasses etc manufactured in Europe.
  • Growing at 7% less than global photonics growth

Components are big business
**Component or System?**

- What is a system to one is a component to another
  - It depends where you are in the supply chain

“A discrete device ... whose characteristics .....can be independently measured and is capable of being packaged with other devices”

- Include laser diodes, LEDs & CCDs but not solid state lasers & cameras

**Anything can be a component**
Where are the opportunities?

- Look at the process flow - raw material to finished component
  - Details for select components and processes in full report

Focus on the manufacturing opportunities
Overall trends

• Common themes/ windows of opportunity emerge

- Complexity
- Integration
- Wafer-scale processes
- Leadership and use of standards
- Leverage CMOS investment
- Leverage customer proximity
- Global suppliers investors markets
- Target high performance

Common trends in many components/ processes
Complexity

• Photonics is maturing, manufacturing getting more complex
  – Low hanging fruit have been picked
  – Opportunities are getting harder

• Examples:
  – Performance over lifetime & temperature
  – Volumes of 10,000’s not 100’s

  More investment,
  More technology
  More interdependency
  = More risk
Integration & Automation

• More functionality without adding complexity for the user
  – Improve delivered value without adding cost.
• Not just better performance, but broader performance
• Examples:
  – Photonics integrated circuits – more functions per device.
• Adding functionally without adding cost = automation
  – 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 simultaneous.
  - 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
Proximity & globalisation

• Photonics is as 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.
High performance

- Europe is seen as Engineering and Innovation leader – leverage this.
  - Culture is quality not cheap and cheerful
- There are High returns from high performance/ specialist devices at modest volume.
  - You don’t have to make volume to make money, it may not even help!
- Markets with low product churn e.g. Medical may be better matched to Eu engineering approach
- Don’t neglect the profits in manufacturing tooling
Standards

- More integration needs standards
- Wafer fabrication needs standards
- Automation needs standards
- Adding complexity needs standards

- To be useful standards need to be defined and adopted

- Applying standard developed by others hurts
  - To benefit Europe needs to lead the definition and adoption of standards.

Standards = maturity

Participate in generation of standards
External Factors

Select highlights
External influence on opportunities

Economic
- Euro uncertainty
- Access to capital
- Demand for efficiency
- Skill shortages
- Vertical integration

Socio-cultural
- Investment expectations
- Risk tolerance

Technology
- Enabling/supportive
- Disruptive
- Competitive

Environmental
- Raw materials
- Carbon and energy efficiency

Political
- Innovation support
- Investment support
- Chemical regulation
- Free trade

European photonics component manufacture

Don’t ignore outside influence
Economic Factors

Macro-economics increasing impact as industry grows

Demand for efficiency
- Creates opportunities replacing past processes

Access to capital
- Think International

Euro uncertainty
- Companies hoarding cash

Final market diversity
- Strengthens industry if you play in multiple markets

Personnel availability
- Significant risk to EU industry

Vertical integration
- Contracting offshore = faster to market/cheaper in near term
- Risk automation being developed elsewhere

Economic viability
Socio-cultural

Investment expectations
- Are you in it for the long or short term
- Don’t neglect the cultural influence

Risk tolerance
- Comfort with risk is culturally embedded
- If don’t take engineering risk products won’t be first to market.
Technology

Enabling/Supportive
- electronics
- software
- materials science
- nano-technology

Competitive
- bonding
- electronics
- nano-technology

Interchangeable

Disruptive
- Fusion - a game changer
- creating a component industry greater than anything we see today
Raw materials
- Rare Earth's, Tellurium, Indium
- Plenty around issue is access
- Takes years to turn on new supplies
- How many photonics researchers refine their own raw materials?

Carbon and energy efficiency
“A focus on energy consumption will have a positive impact on photonics”
Politics

EU and national innovation support
- Change with KETs, Horizon2020 & Photonics PPP
- Job creation
- SME support moving to EU?

Direct investment support
- how to get photonics on par with older industries
- needs scale

Chemical regulation
- REACH could make Eu manufacturing less competitive

Free trade
- We need it
- Previously too small to notice
- Beware PV showdown

Political influence

Photonics is the largest KET, expect more politics
More....

- Project supported by EPIC – European Photonics Industry Consortium.
  - Tom Pearsall / Carlos Lee
- Contributions and inputs from EPIC members, Photonics 21 and participants in Berlin workshop in October 2011 acknowledged
- Full report available from www.Harlinltd.co.uk/reports
  - Detailed analysis of current markets and identification of global and European opportunities/ trends in-
    - Integrated Photonics
    - Optics
    - Sensing, Imaging & Projection
    - Packaging and
    - Test, Measurement & Reliability.
  
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