Automated assembly solutions as key for mass manufacturing of highspeed photonic transceivers

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FICONTEC photonics assembly & testing



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Photonics Days Berlin Brandenburg



Automated assembly solutions as key for mass

manufacturing of high-speed photonic transceivers

Dr. Moritz Seyfried Manager Research & Development

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Four demonstrators:

Masstart

- 400Gb/s 4-channel PSV4 module in QSFP-DD format
- 800Gb/s 8-channel WDM module in a QSFP-DD format
- 1.6 Tb/s 16-channel WDM on-board module

 $\in 1/Gb/s$ or even lower in mass production

• Tunable single-wavelength coherent transceiver with 600Gb/s capacity

Mass manufacturing of Transceivers for Terabit/s era to bring the cost down to





Masstart

Mass manufacturing of Transœivers for Terabit/s era to bring the cost down to €1/Gb/s or even lower in mass production

To achieve this, multiple new concepts are introduced:

- WAFT for spot size and pitch converters
- 3D packaging via through silicon vias
- New laser chip design
- .. (you will see in the next presentations)





Masstart

Mass manufacturing of Transœivers for Terabit/s era to bring the cost down to €1/Gb/s or even lower in mass production

To achieve this, multiple new concepts are introduced:

However:

Testing and assembly remains **THE** cost driver for photonics assembly and packaging





Gobal Partner

20 years of experience





Value chain of QFSP module





Demonstrator 1: Tx of QSFP-DD format with 400G



Design: Dust Photonics

Total of 7 optical components:

- Laser array
- Two Lens array
- Isolator
- Prism
- SP-PIC
- Fiber array



Demonstrator 1: Tx of QSFP-DD format with 400G



Passive steps (vision based alignment):

- Laser array
- S-PIC
- Prism
- Isolator



Active steps (power module):

- Laser lens array
- Fiber/lens array



Demonstrator 1: Tx of QSFP-DD format with 400G



Design: Dust Photonics

Passive steps (vision based alignment):

- Laser array
- S-PIC
- Prism
- Isolator



Masstart goals (FIC):

- Verify feasibility of passive alignment concept
- Cost efficient passive assembly solution

28.10.2020



Keys to lower assembly costs for passive step

- 1. Cose collaboration between product owner and assembly partner
 - \rightarrow Ensure easy assembly strategy

- 2. Final product cost defined by
 - Machine costs
 - Footprint / Clean room area
 - Throughput
 - (running costs)





Passive assembly concept Masstart

Robot (pick and place) Final cost defined by Assembly Stations (4x) Machine costs • Footprint / Clean room area Tray for gel packs Throughput Conveyor Throughput of all assembly steps!

28.10.2020



From Prototype Machines to Mass Production



28.10.2020



Possible layout of mass manufacturing line for data center interconnects



Condusions

- Assembly is (and will remain) the cost driver for photonic products
- Last decade was mainly on improving individual assembly machines
- Next decade will be on introducing a higher level of automation (multiple stations within one machine, connected machines, line control, ...)

Masstart results:

- High throughput machine for passive 1-2 um alignment
- Integration of passive and active machines into one assembly line









Thank you!

For further information please feel free to contact Moritz.Seyfried@ficontec.com

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