Design challenges of hybrid PICs

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Luceda Photonics

take control of your photonics design flow
We want to make photonic IC designers enjoy the same power as electronic IC designers.

We supported the tape-out of over 400 designs within 10 years.
IPKISS is validated over > 400 designs.

Fast growing customer base, including 2 Fortune-500 companies.
The IPKISS design framework for design automation

- From a single environment
- Component & circuit layout
- Physical & circuit simulation
- Characterization & testing
- Python powered
- Validated on >400 designs

Native platform for IMEC & IHP PDK
Hybrid PICs combine several technologies, foundries and material systems.
Hybrid PICs require a hybrid automated design flow.

- Hybrid virtual PDKs
- Hybrid single final GDSII
- Hybrid verification
Single IPKISS PDK

- **Verification**
  - DRC – Calibre deck
  - Circuit simulation
  - Layout aware verification

- **Components**
  - Parametric cells
  - Component models
  - Waveguide templates
  - Simulation recipes

- **Technology**
  - GDSII Layers
  - Virtual fabrication settings
  - Design Rules
  - Gridding

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![Lumerical Schematic](image-url)
Hybrid PDKs: PDK is a design parameter

from isipp50g import technology as TECH1
from custom_inp import TECH2
TECH = combine_tech(TECH1, TECH2)

Virtual hybrid PDK
Virtual hybrid technology

- Virtual technology is created that contains all layers as if it was a single process
- Additional layers are added (e.g., Keep out layers)
- Material Stacks are added on top of each other (assumes planarization)
Components

- All existing components remain available in the virtual TECH.
- Possibility of creating **hybrid** components that address both technologies as a single component.
- Simulation recipes take advantage of the full virtual layer stack.
- Allowing separation to have “technology agnostic” components.
- Allowing the automation of model extraction using Multiphysics simulations.
Verification by DRC

- Design rules are executed with a combined DRC deck on a single GDSII
- Additional rules can be added.
  - Keep out distances
  - Minimum overlap
  - ...
Verification by circuit simulation

- Strong link between layout and circuit simulation.
- Strong automation of component model generation
- Incorporate “location dependent” parameters into the simulation
  - Location dependent temperature (laser – SOA)
  - Location dependent process variation (varying thicknesses)

Bogaerts, Wim, Umar Khan, and Yufei Xing. "Layout-Aware Yield Prediction of Photonic Circuits"
Conclusion

- Luceda provides very flexible and integrated design flow
- Virtual hybrid PDKs
  - Virtual technology
  - Hybrid component design
  - Hybrid verification strategies
We are hiring

Located in Dendermonde – Belgium PIC Region: Gent, Leuven, Aachen, Eindhoven

Work with several Fortune 500 companies & advanced startups on trailblazing PIC Design

You are
- An expert in computer programming
- A Pre- and post sales integrated photonics application expert

You are
- Excited to work in an international team
- Eager to interact with others

Come talk to us, send us an email: hr@lucedaphotonics.com