

Generic Integration Technology & JePPIX InP Foundry Platforms

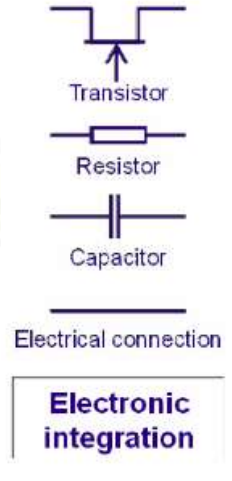
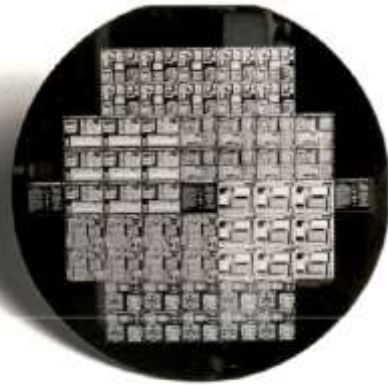
Martin Schell, Executive Director, HHI

on behalf of JePPIX, University of Eindhoven & HHI

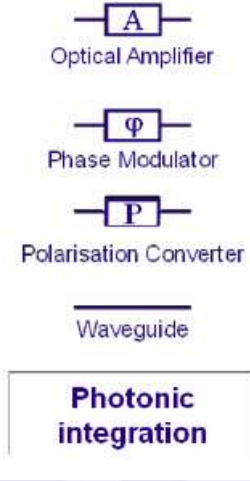
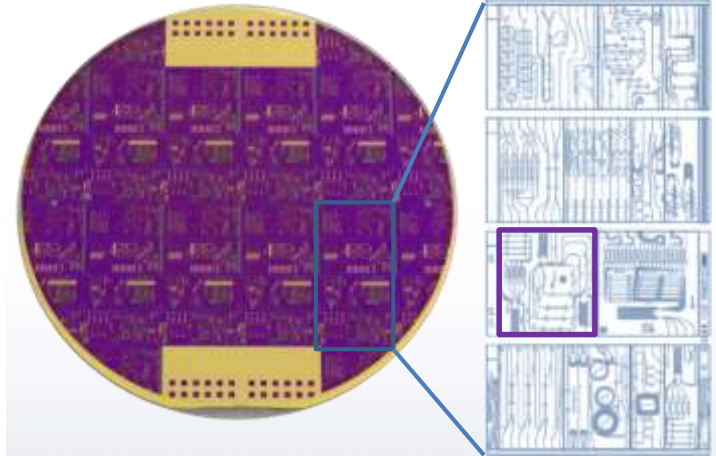


Generic Integration in Photonics

Silicon ICs ~1979



Photonic ICs ~2014



- As usual, Photonics is ~40 years behind electronics 😊
- Separation of process and design was key for electronics, will also push photonics

InP Broker: JePPIX Ecosystem of Designers, Foundries, Packagers



JEPPPIX

Providers

CAD/PDK

Broker: Access

Design House

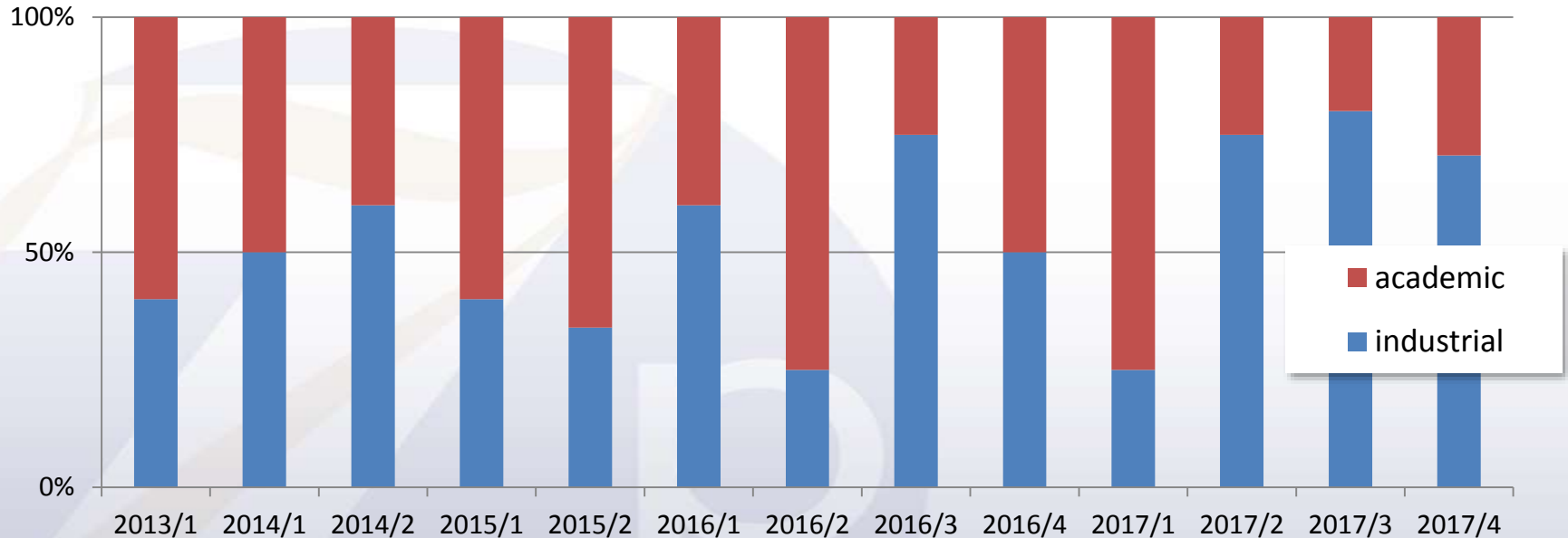
Fabrication

Packaging / Assembly

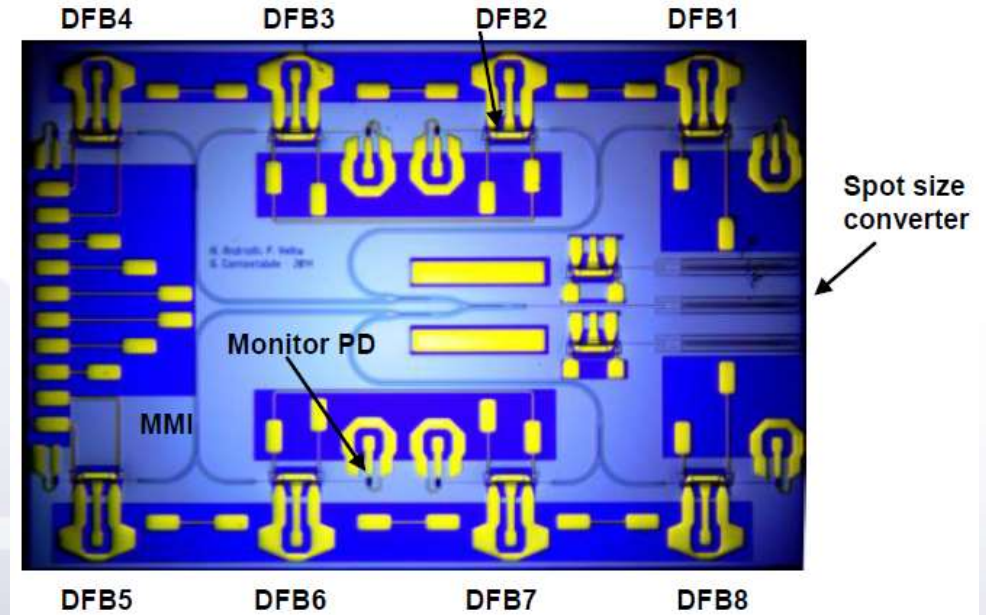
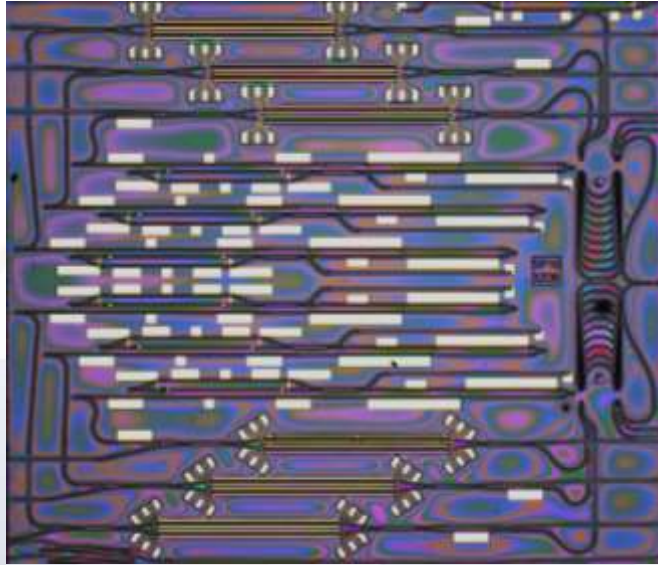


JePPIX (InP): So far, Roughly Equal Interest from Industry and Academic

User share evolution (Example HHI Fab)

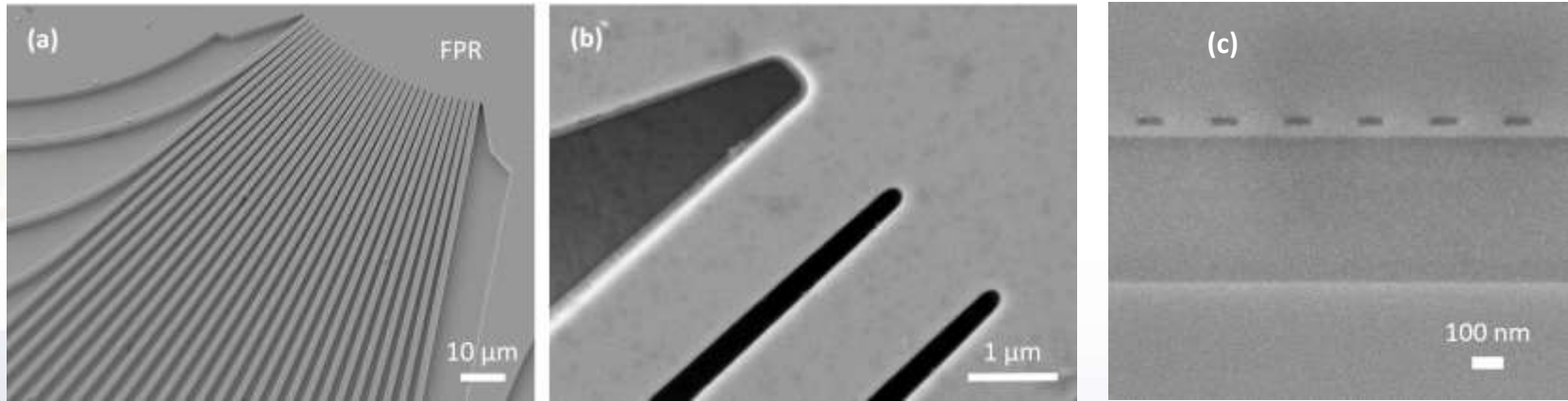


Application Example: monolithic WDM transmitters



- Demonstrated with both platforms for DFBs, tunable lasers, Mach-Zehnders
- Credits Yao CLEO PR 2017 on Smart and Andriollo JSTQE 2018 on HHI platforms

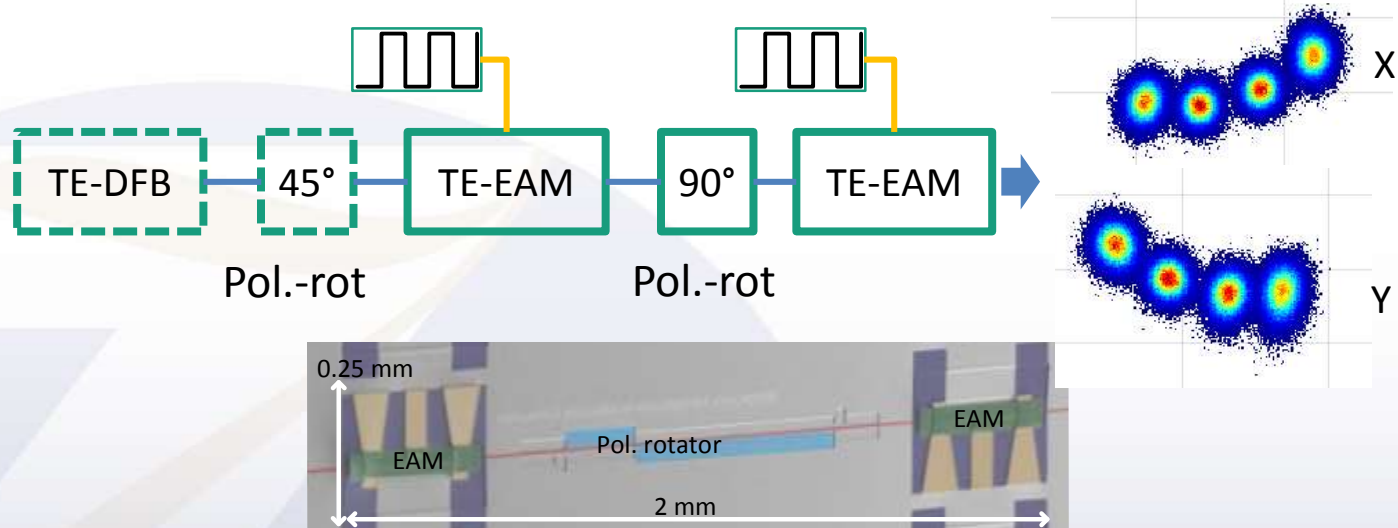
New @U Eindhoven: First high resolution DUV lithography for InP



- Enabling low excess loss arrayed waveguide gratings – sub 0.5 dB excess loss
- Precision gratings for lasers and filters
- Latest JePPIX user research in JSTQE 2018 special issue on Indium Phosphide Integrated Photonics

New @HHI: Polarization Rotation

Used here for small chipsize dual polarization modulator (112 Gbit/s dual pol PAM4 @ 28 Gbaud)



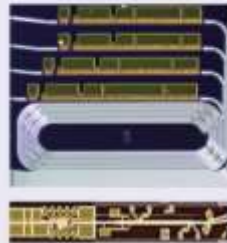
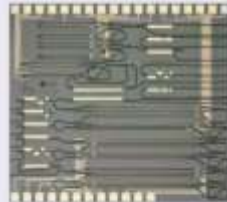
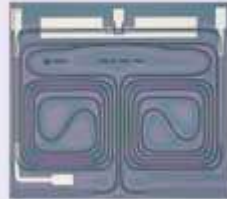
- 112 Gbit/s PDM-PAM4 (28 Gbaud)
- 90° rotation without any combiners/splitters included in the PDK and available per now
- 45° rotation to follow

More than 350 PICs fabricated in JePPIX foundries

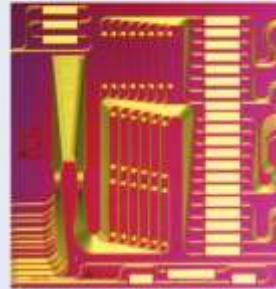
THz and RF circuits



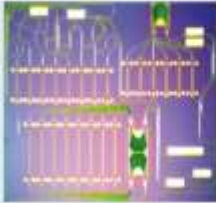
Variety of Lasers



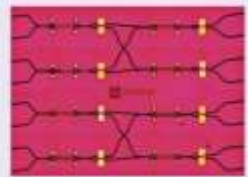
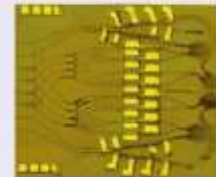
Medical and bio-imaging



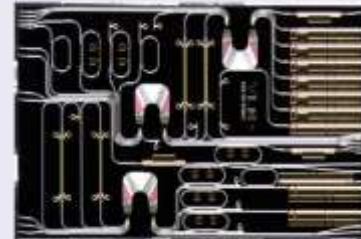
Optical data handling



Optical switching



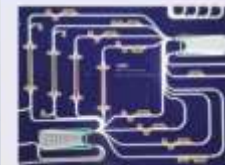
Microwave photonics beam-former




Sensor readout units



Fibre to the home



There are alternatives to InP ... how to choose the right platform?

	Silicon Photonics	Silicon Nitride	InP	Polymer
	Best for e/o integration Smallest size	Best for longest waveguides Lowest loss	Best for laser / actives integration Most mature	Lowest upfront and volume costs Easiest for hybrid integration
	Difficult to get light in and out	No actives integration, no e/o integration	High area costs Only 1.3-1.7 μ m	Least mature