

The Eastern European design hub

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Eastern European Design Hub

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Eastern European Design Hub

at Warsaw University of Technology

Institute of Microelectronics and Optoelectronics



- › State-of-the-art **expertise** and **support** of the application partners in: photonic ICs **design** and **characterization**
- › Enable **access** to highest-level **photonic integration technologies**
- › **Disseminate** the knowledge of photonic ICs and applications



Eastern European Design Hub

- › Dedicated software:
photonic IC design



- › Characterization lab:
opto-electronic components



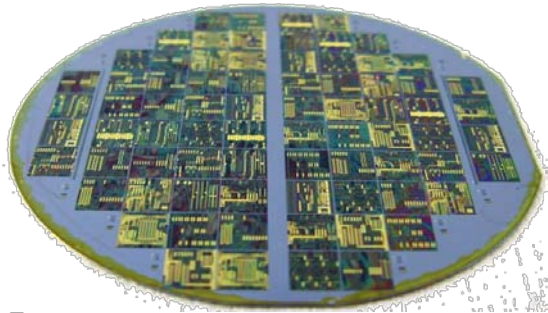
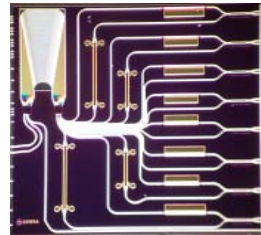
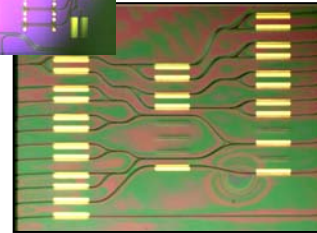
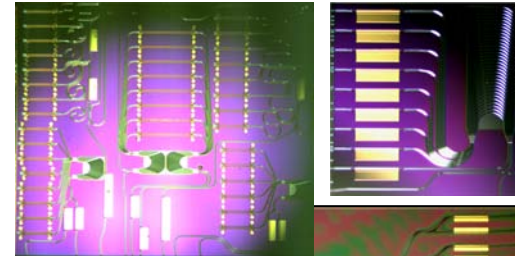
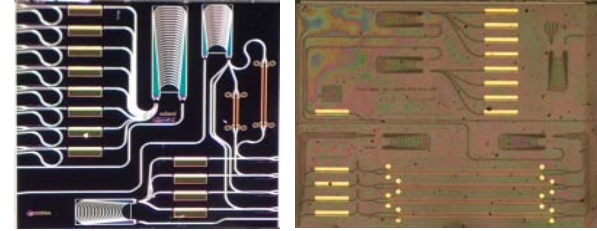
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› Application users:



Application specific photonic ICs

- › Applications: telecom and datacom, readout units, metrology, fiber systems
- › Fabrication: multi-project wafer run in **generic processes**
- › Fabs: Oclaro, HHI, COBRA (JePPIX) : **InP platforms**



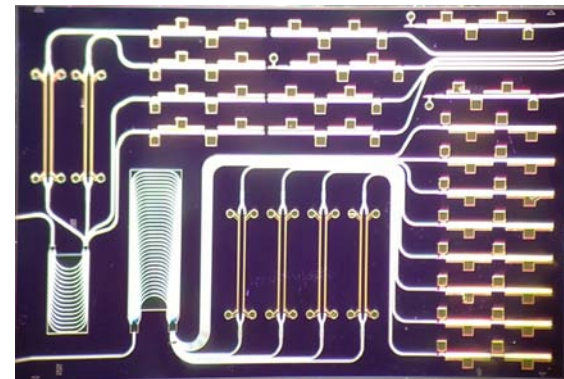
OCLARO 

 **Fraunhofer**
Heinrich-Hertz-Institut

JEPPPIX

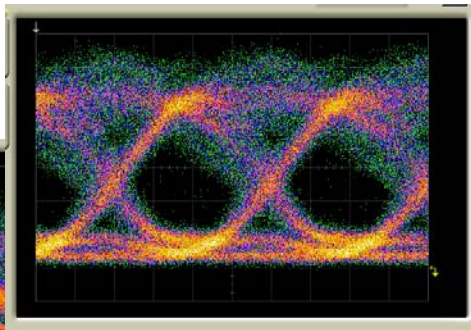
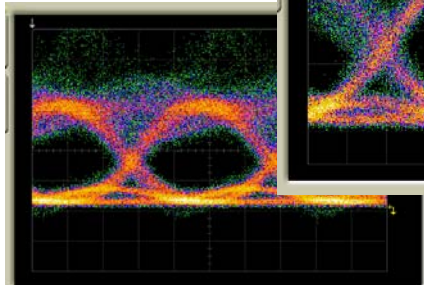
Application: telecom

- › **Multiwavelength transmitter: 4 mm × 6 mm array of DBR lasers with Mach-Zehnder modulators**
- › **4-channels (200 GHz), 8-channels (100 GHz):**
 $I_{th} < 18$ mA, P_{out} : up to 4 dBm, SMSR > 50 dB,
DBR tuning: up to 9 nm
12.5 Gbps per channel, V_{π} : 3 V

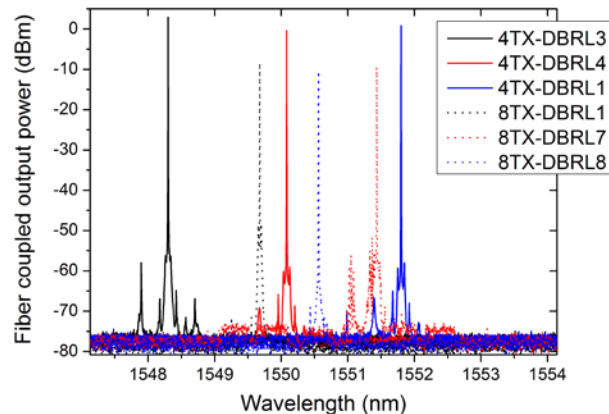


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12.5 Gbps MZM



K. Lawniczuk, et. al, PTL2013



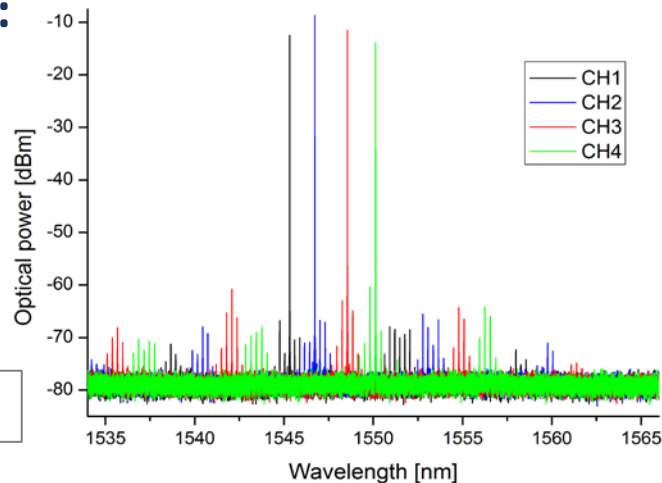
Application: datacom

- › **Transmitter – receiver: 4 mm × 4.6 mm**
Fabry-Pérot lasers with AWG as filtered feedback,
Mach-Zehnder modulators,
array of photodetectors with AWG

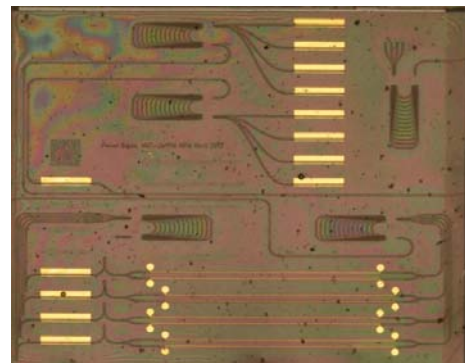
- › **4-channels (200 GHz):**

$I_{th} < 25$ mA,
 $P_{out} > -15$ dBm,
SMSR > 45 dB
MZM : $V_{\pi} = 5$ V

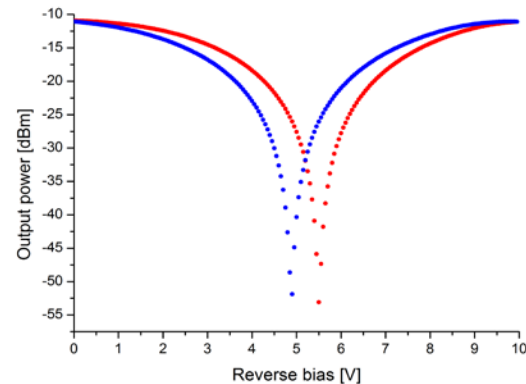
S. Stopinski, et. al, CLEO2013



FP lasers



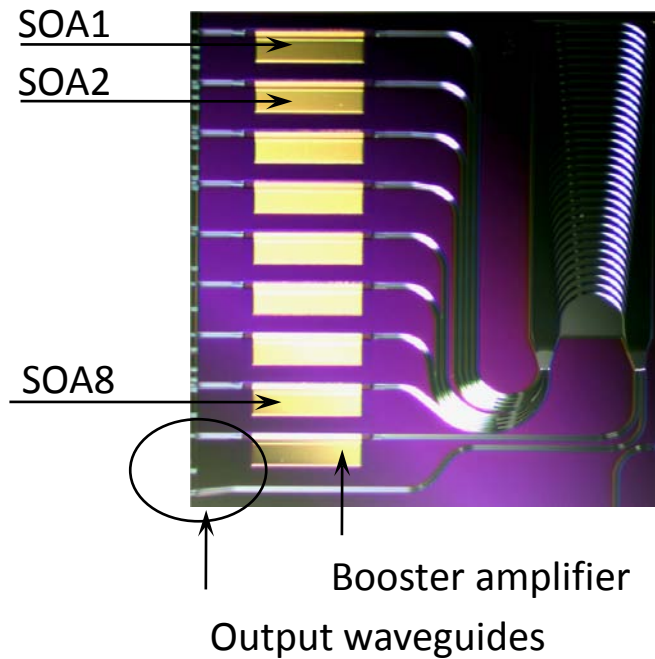
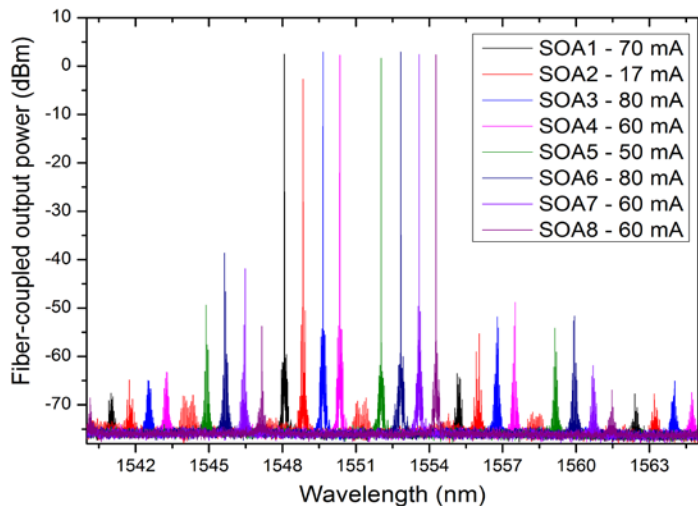
UEPPIX



MZMs

Application: optical access networks

- › **Multiwavelength laser: 2 mm × 2.3 mm**
AWG-based laser with booster SOA
- › **8-channels (100 GHz):**
 $I_{th} < 15 \text{ mA}$, P_{out} : up to 5 dBm, SMSR > 40 dB,

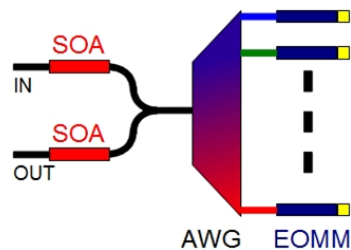
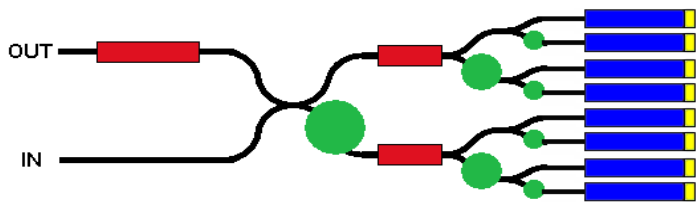


K. Lawniczuk, et. al, IPRM2011

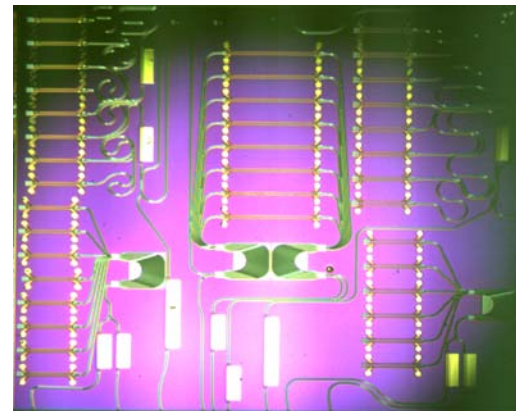
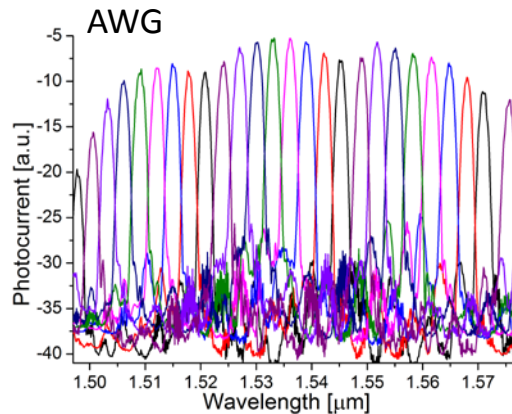
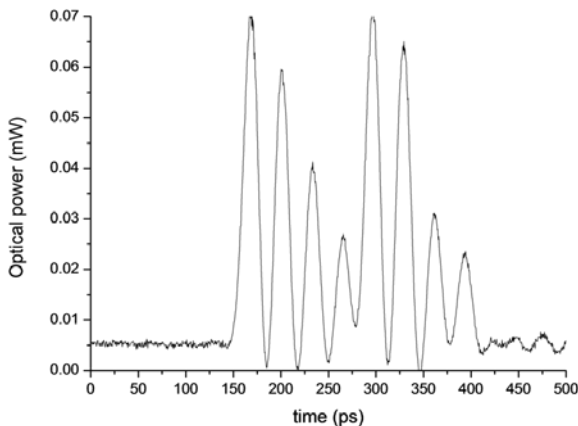
OCLARO 

Application: readout units

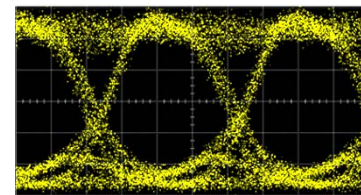
- › **8:1 serializer and multiplexer (400 GHz) : 6 mm × 6 mm**
Mach-Zehnder Interferometers with delay lines and AWG



Pulse response



OCLARO 

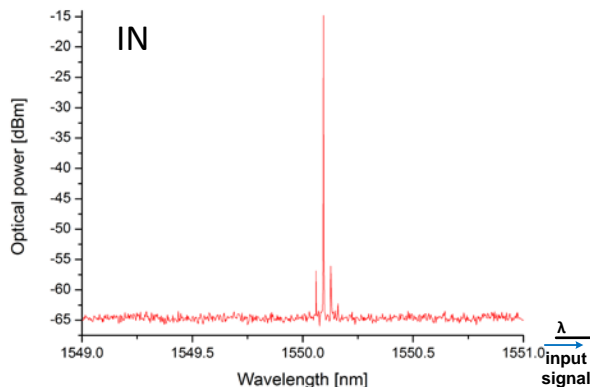


12.5 Gbps Michelson modulator

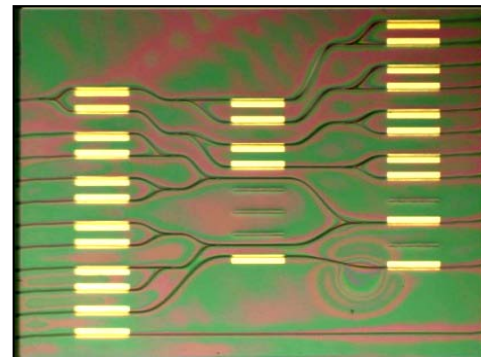
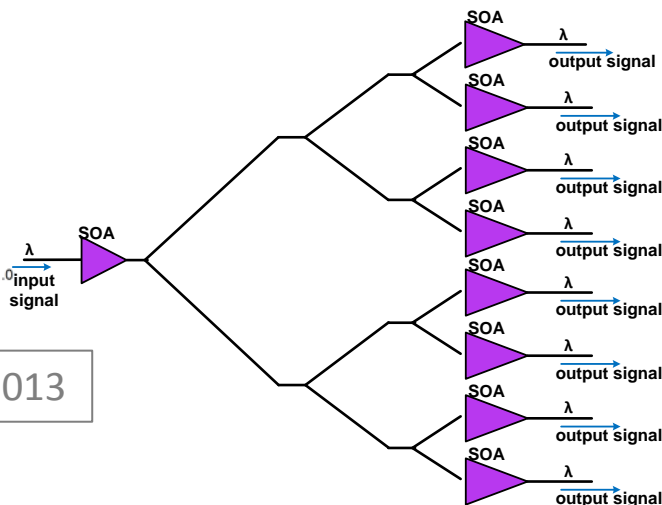
S. Stopinski, et. al, OFC2013

Application: fiber systems

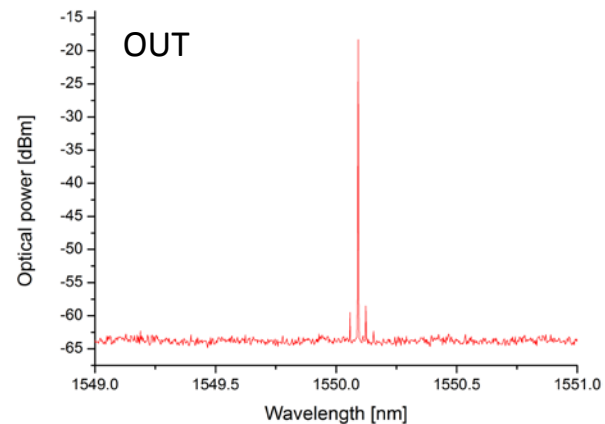
- **1 × 8 loss-compensated power splitter: 4 mm × 4.6 mm array of SOAs and passive splitters**
- **Compensation level at : SOA = 30 mA (each)**



S. Stopinski, et. al, CLEO2013



JEPPIX



and many others...

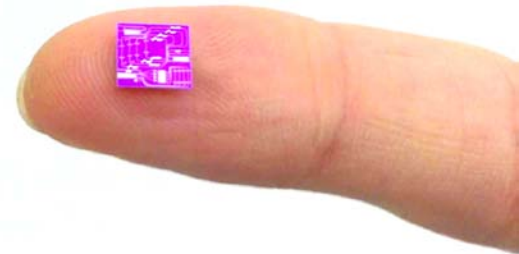
... currently under test and development



Integrated photonics :



- › compact
- › highly integrated
- › multifunctional
- › high speed
- › energy efficient
- › cost effective when fabricated in generic processes via MPW runs



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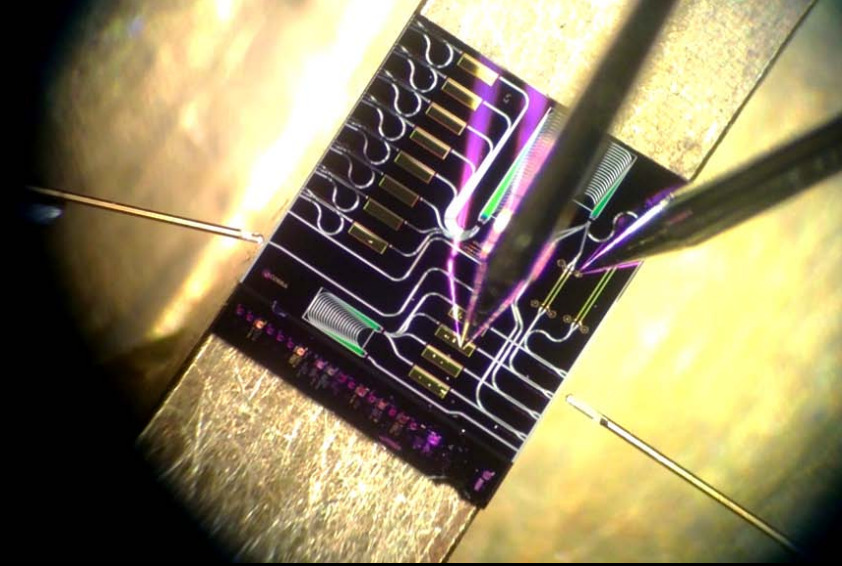
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