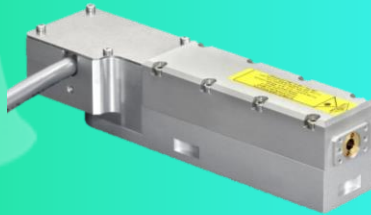


ULTRA-SHORT PULSE LASERS and GLASS PHOTONIC CIRCUITS



Powerchip laser



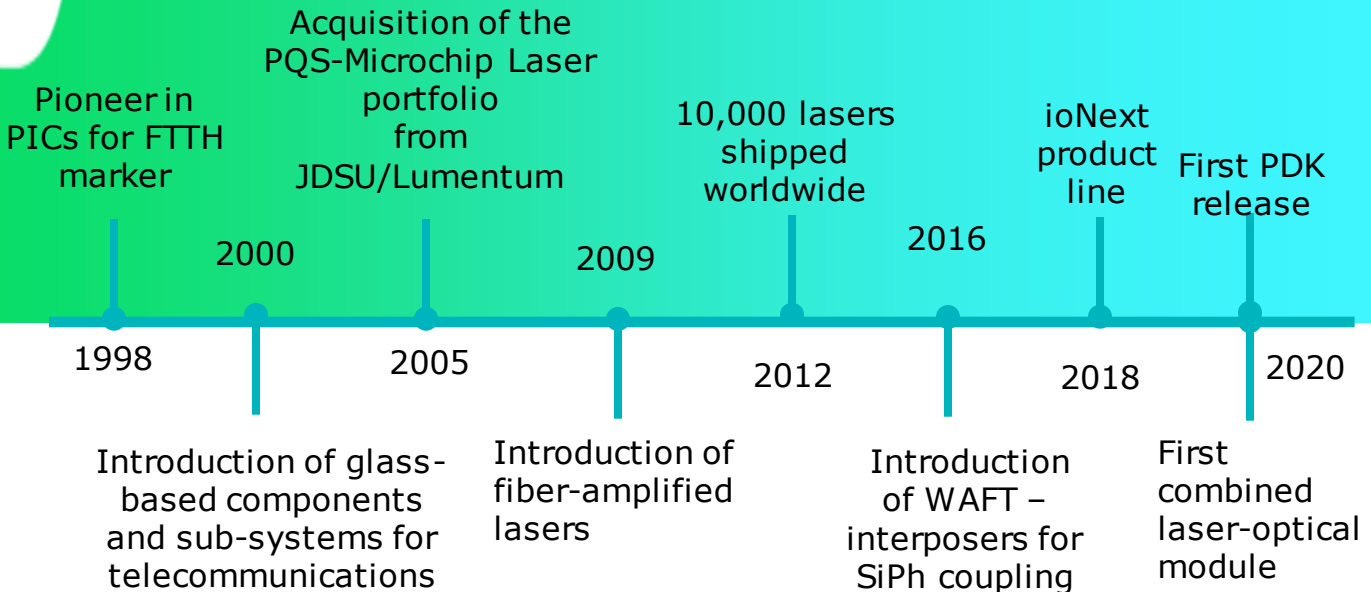
Microchip laser



Custom glass PIC

A unique expertise in photonics since 1998

- Products covering laser and integrated photonics
- Headquartered in the microtechnology hub of Grenoble
- A strong R&D team to address cutting-edge applications, in a SME of 50-people staff

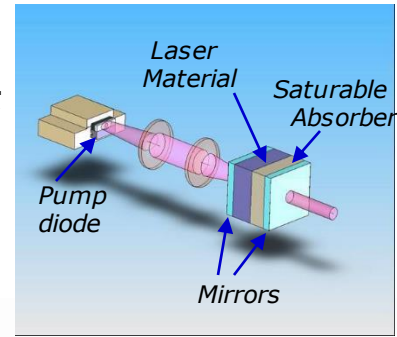


Microchip DPSS-laser: the simplest of the ultrafast lasers

A Microchip laser turns the continuous power of a semiconductor laser diode into a stream of **high peak power picosecond pulses**. Teem Photonics' lasers are based on this technology. Visible and UV wavelengths are generated from harmonic conversion.

Benefits:

- > Compact
- > Cost effective
- > Reliable



For your application, find your pulsed microchip laser solution

Microchip series: highest compactness and high average power

Powerchip series: highest peak power and shortest pulses at kHz repetition rates

→ Externally triggered versions available in both series for control of the repetition rate

PicoOne, **PicoMega** and **PicoSpark** series: amplified lasers based on a microchip seeder and an efficient MOFA (Master Oscillator Fiber Amplifier) amplification stage. Shortest pulses or highest energy per pulse/peak power at over a hundred kHz repetition rates.

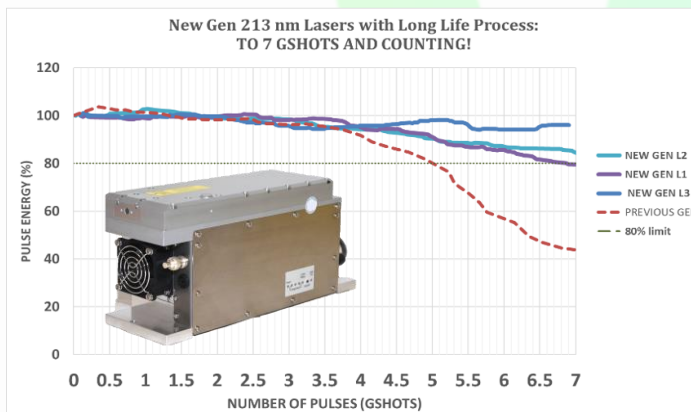
→ Full control over the pulse energy (or peak power) while leaving unchanged the pulse width and pulse shape

KEY FEATURES

- > Wavelengths:
 - o 213nm, 266nm, 355nm, 532nm, 1064nm, 1535 nm, 1995nm
- > Pulse duration : **150 ps**...900 ps (and up to 10 ns)
- > Peak power : up to **300kW**
- > Repetition rate : up to **150 kHz**
- > Output power : up to 7 W
- > Beam quality : TEM00, IR **M² = 1.05 typ.**
- > **Exceptionally long lifetime** including the deep UV models



PicoOne amplified laser



Example: lifetime test results for a **213nm Powerchip** laser which show **more than 80% power after 7GShots**

MAIN APPLICATIONS

- > Bioimaging: mass cytometry
- > Microdissection
- > LIDAR
- > Diamond marking
- > Sensing and instrumentation
- > Supercontinuum generation
- > LIBS spectroscopy
- > Materials processing
- > etc.



For any further information, please contact our sales team
Email: sales@teemphotonics.com / Phone: +33 (0)4 76 04 05 06

NEW DEVELOPMENTS

2µm Microchip lasers: passively and actively Q-switched models

OPTICAL PERFORMANCE RANGE:

- ›Wavelengths: fixed at 1.95µm or **tunable** from 1.94µm to 1.96µm
- ›**Single longitudinal mode**
- ›Energy per pulse: up to **250µJ**
- ›Pulse duration: 30ns..50ns
- ›Repetition rate: tunable up to **5kHz**



Picture of the 2µm PQS laser prototype



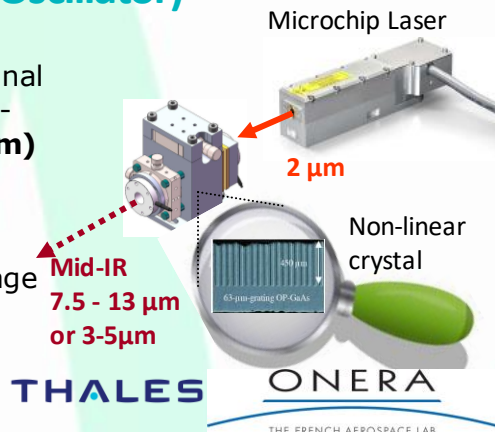
Mechanical drawing of the 2µm AQS laser prototype

Mid-IR tunable OPO source (Optical Parametric Oscillator)

Our Optical Parametric Oscillator source converts the input signal from a 2µm pump laser into tunable Mid-IR beam using a non-linear crystal. We achieve **broad LWIR tunability (7.5-13µm)** based on Orientation-Patterned GaAs crystal.

The OPO source we offer is uniquely **compact**.
Option: additional **Optical Parametric Amplifier (OPA)** stage for a much higher output power.

Source developed in partnership with ONERA and Thales Research and Technology



THALES

ONERA
THE FRENCH AEROSPACE LAB

KEY FEATURES:

- ›Wavelengths tunability: **7.5 to 13µm** and **3-5µm**
- ›**Single longitudinal mode**
- ›**Real-time wavelength control** with **Spectrum Analyzer** included
- ›Peak power: 5W; **up to 100W with the OPA option**
- ›Repetition rate: fixed at 300Hz or 1kHz
- ›Pulse duration: 30ns..50ns
- ›**Compact source:** ~297mm*210mm*80mm (~A4 footprint)

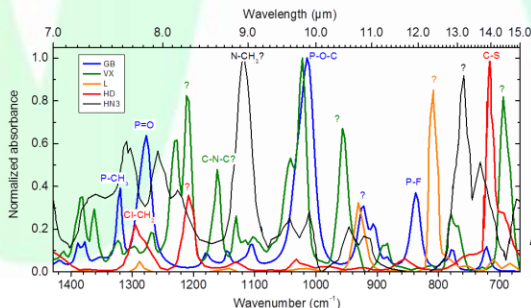


Picture of the prototype of the Mid-IR OPO compact source (on the left) and its controller (on the right)

Availability: Q4 2021

MAIN APPLICATIONS

- › Stand-off gas detection
- › Multi-species gas analysis
- › LIDAR applications
- › etc.



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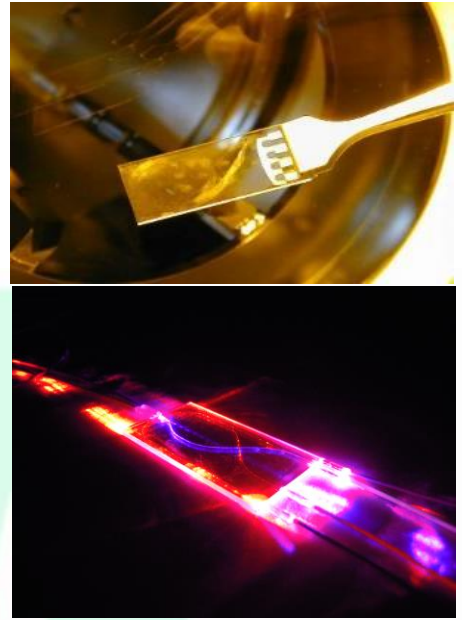
teem
PHOTONICS

The ioNext Photonic Integrated Circuit platform

Teem Photonics offers Photonic Integrated Circuits based on its reliable, versatile and cost-effective ioNext platform.

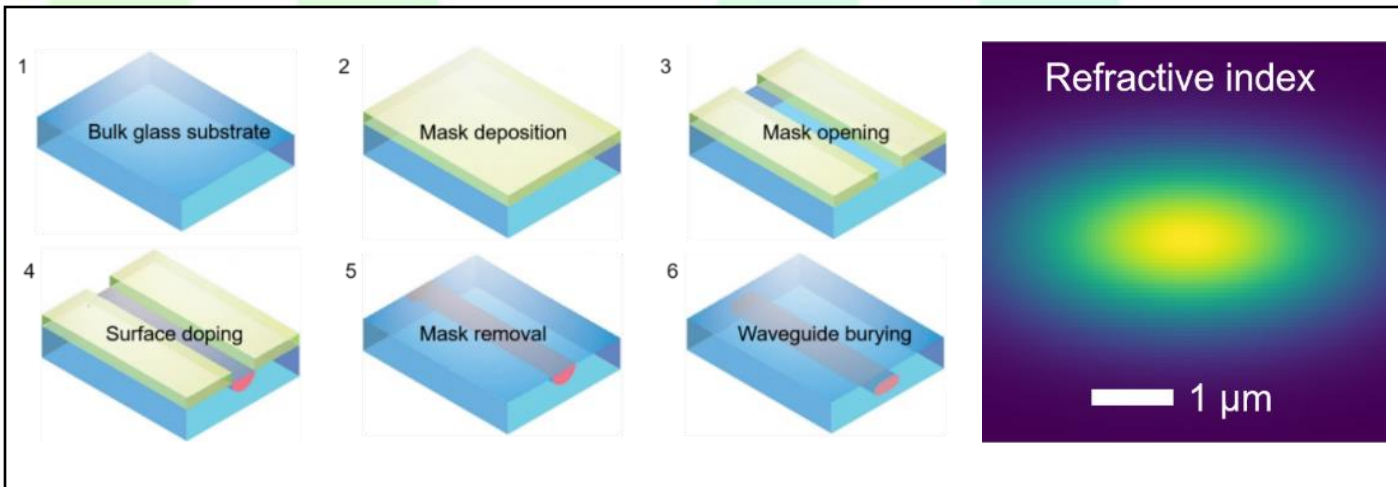
Teem's specific ion-exchange process enables robust manufacturing of PICs (also called PLCs) in a record turnaround time of 4 weeks. These can be tailored into customer-defined photonic circuits or into innovative solutions for semiconductor PIC packaging (the WAFT series).

Teem provides integrated photonics solutions to worldwide-based customers active in Datacom & Telecom, Integrated Sensing, Biomedical, Autonomous Vehicle, Energy, Defense.& Space...



The ioNext process flow

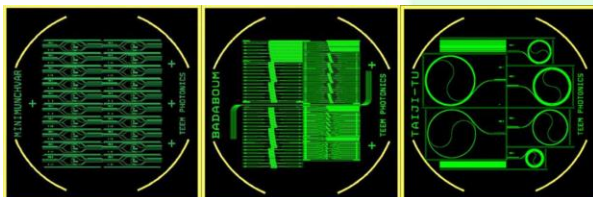
The ioNext waveguides are patterned onto a proprietary glass substrate via masking and photolithography, thanks to selective doping where the mask has been etched. It results in gradient-index waveguides featuring a precisely controlled MFD and effective index.



An offer beyond the foundry

PIC DESIGN

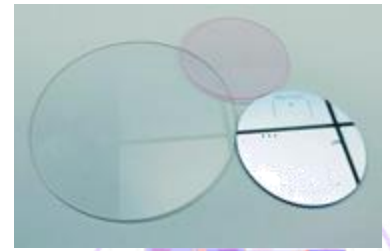
ASSEMBLY AND PIGTAILING



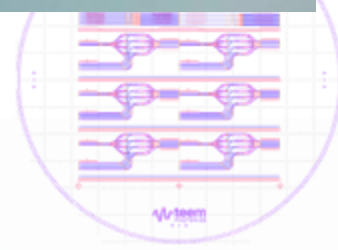
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Customized Photonic Circuits

Teem Photonics offers a portfolio of on-chip building blocks (optical functions) that can be combined to perfectly fit our client requests over the **whole transparency range of glass (400 – 2000 nm)**.



The optical functions present specific qualities finding their roots in the ioNext technology: efficient coupling with optical fibers, very low insertion and return loss, excellent polarization behavior (no PDL, PM)... All of them are available through a continuously updated **Process Design Kit**.



BUILDING BLOCKS: splitters & couplers, MUXs, Bragg gratings...



WAFTs for PIC packaging

WAFt (Waveguide Array to Fiber Transposers) are interposer solutions that provide **record coupling efficiency between standard optical fibers and high-confinement Photonic Integrated Circuits**, in a **packaging-ready** footprint. They come in three versions covering all standard PIC optical coupling architectures:

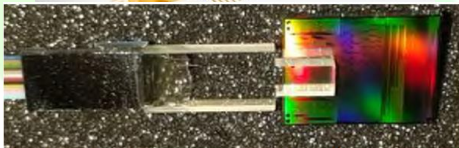
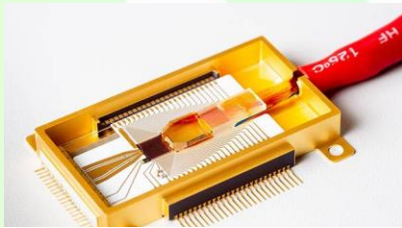


Fig 15 Glass interposer assembled Silicon Photonics Device with Cavity Etched BEOL

Edge coupling	Top coupling	Evanescent coupling
<ul style="list-style-type: none">✓ Low loss solution✓ Compatible with WDM❗ Wafer level incompatible❗ Alignment accuracy	<ul style="list-style-type: none">✓ Compatible with grating couplers✓ Wafer level compatibility❗ Grating coupler loss❗ WDM-limited	<ul style="list-style-type: none">✓ Low loss solution✓ Compatible with WDM✓ Alignment tolerant✓ Wafer level compatibility❗ BEOL constraint

Advanced PIC offer

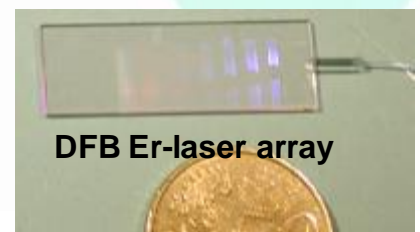
Interferometric sensors



AWGs



Er/Yb-doped PICs



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