

Menhir Photonics



Towards ruggedized
ultrafast lasers in space

Swiss Photonics
General Assembly 2024

The large potential of lasers

Machining/Cutting



3D vision



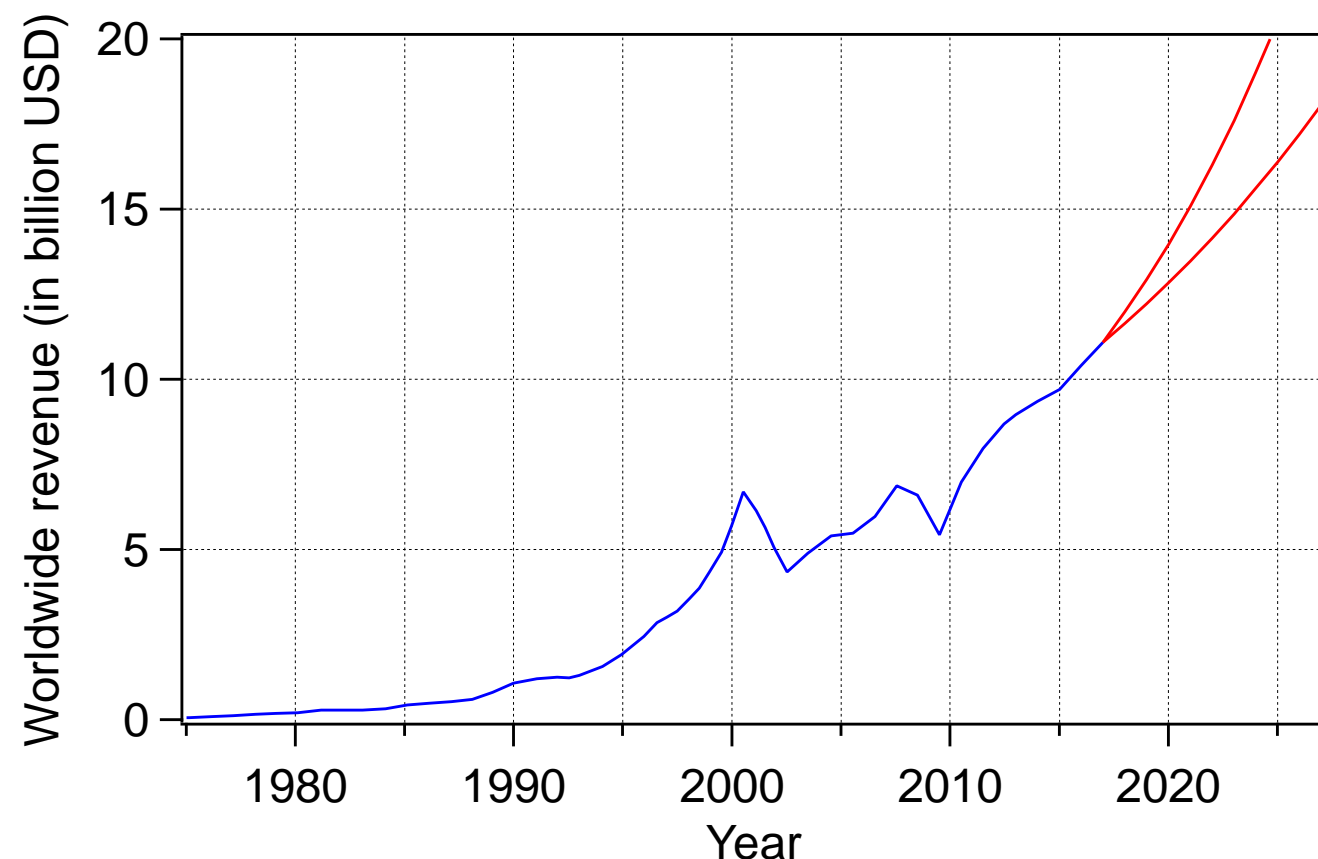
Medical



Data center / Internet



Worldwide market of lasers* (lasers only)



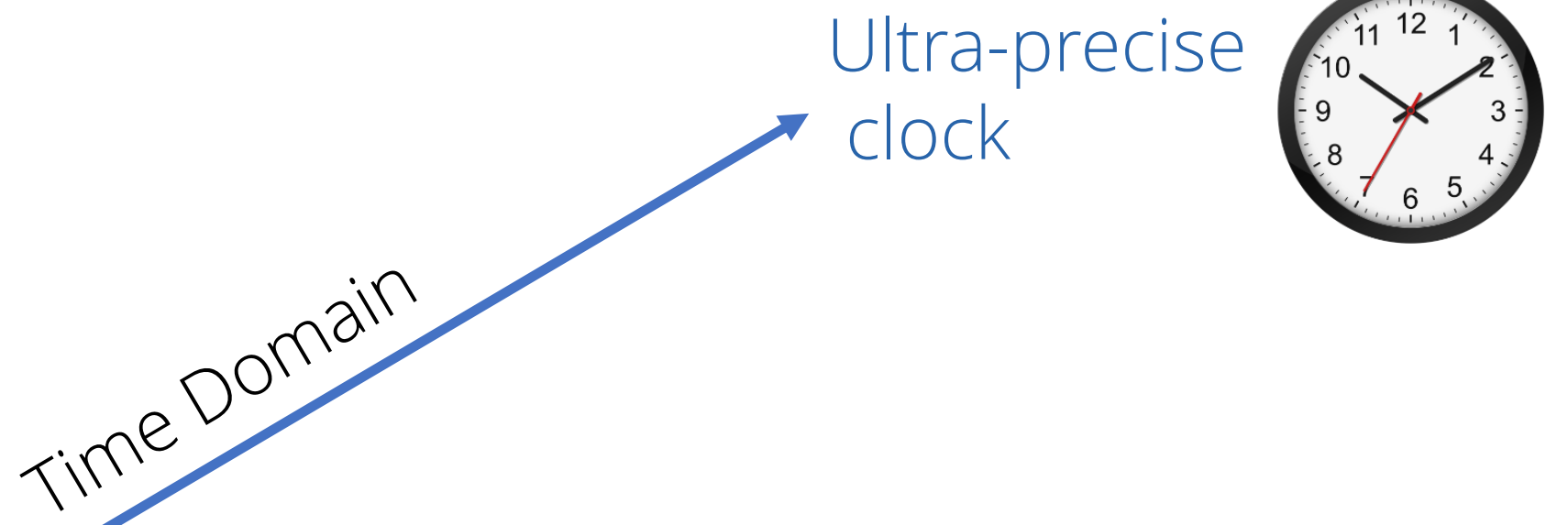
Lasers are key components in many applications
> \$15 billion revenue and high-growth

The enabled markets spread from internet and manufacturing to medical applications
> \$500 billion worldwide market

* "The Worldwide Market for Lasers", Strategies Unlimited (2017)

What is a laser clock?

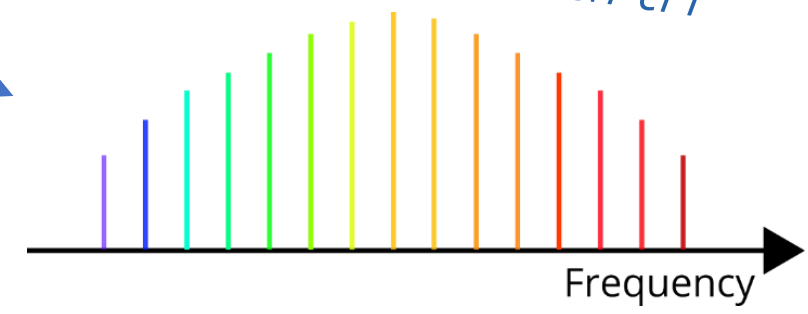
"1 second compared to the age of the earth"



Ultra-precise clock

Optical Domain

"1 μm compared to the distance Moon/Earth"



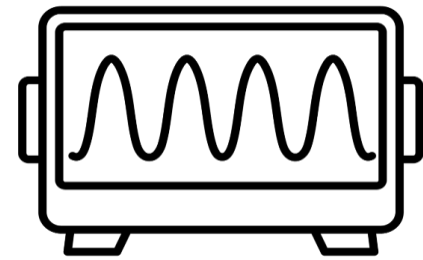
Very well defined comb

Challenge: Network synchronization

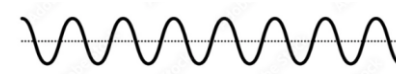
- » Next generation telecom technologies (**5G-Advanced and 6G**) have higher bandwidth enabling connection of more devices with real-time applications
- » Precise time synchronization of infrastructure and real-time applications is mandatory.



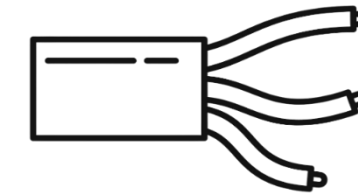
Solution: optical time reference



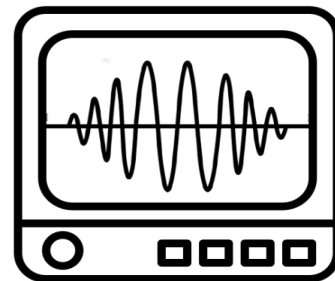
Microwave oscillator



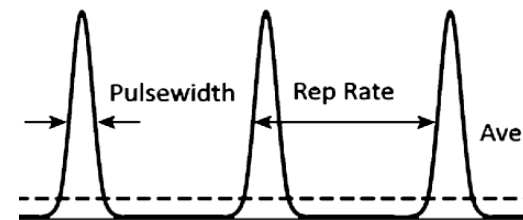
Not precise



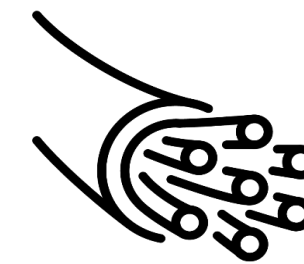
High losses



Pulsed laser



Precise



No losses

Market leaders with upcoming opportunities

- » We prove our credibility with trusted customers.
- » Our lasers are synchronizing majority of synchrotrons in Europe.
- » Customers are approaching us with requests for multiple units per year.

NIST



First turnkey femtosecond laser

Key specifications

- Repetition rate : up to 2.5 GHz
- Clean soliton pulses: < 250 fs
- Wavelength: 1.55 μm (1.0 μm)
- Lowest phase noise laser on the market
- Passively soliton modelocked

Key features

- Hermetically sealed
- All-in-one system
- Turnkey system

1st generation

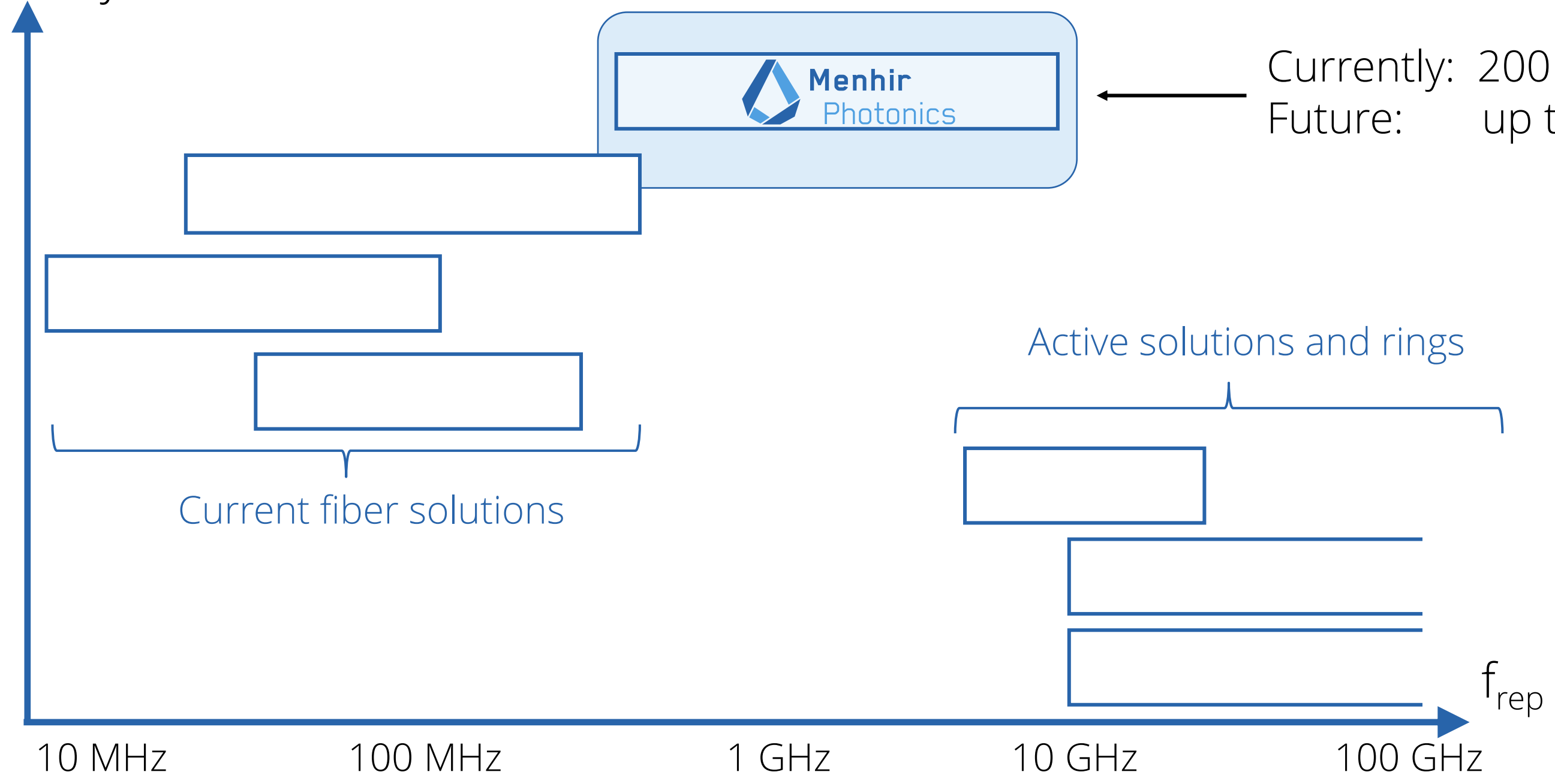


2nd generation



Femtosecond lasers at 1.55 um

Product
Reliability/
Maturity

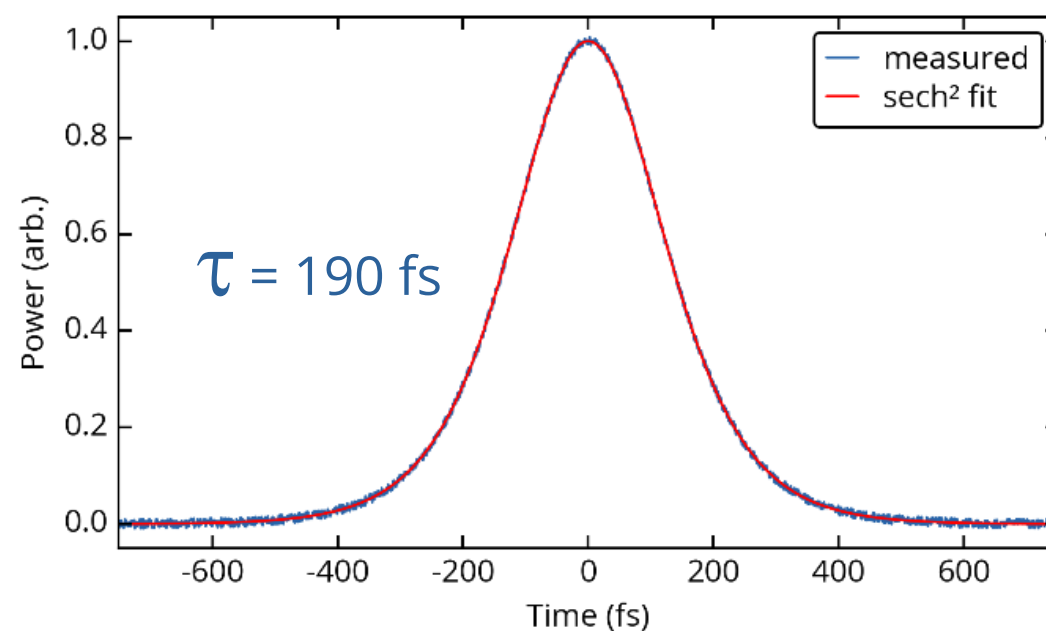


MENHIR-1550 - 1 GHz

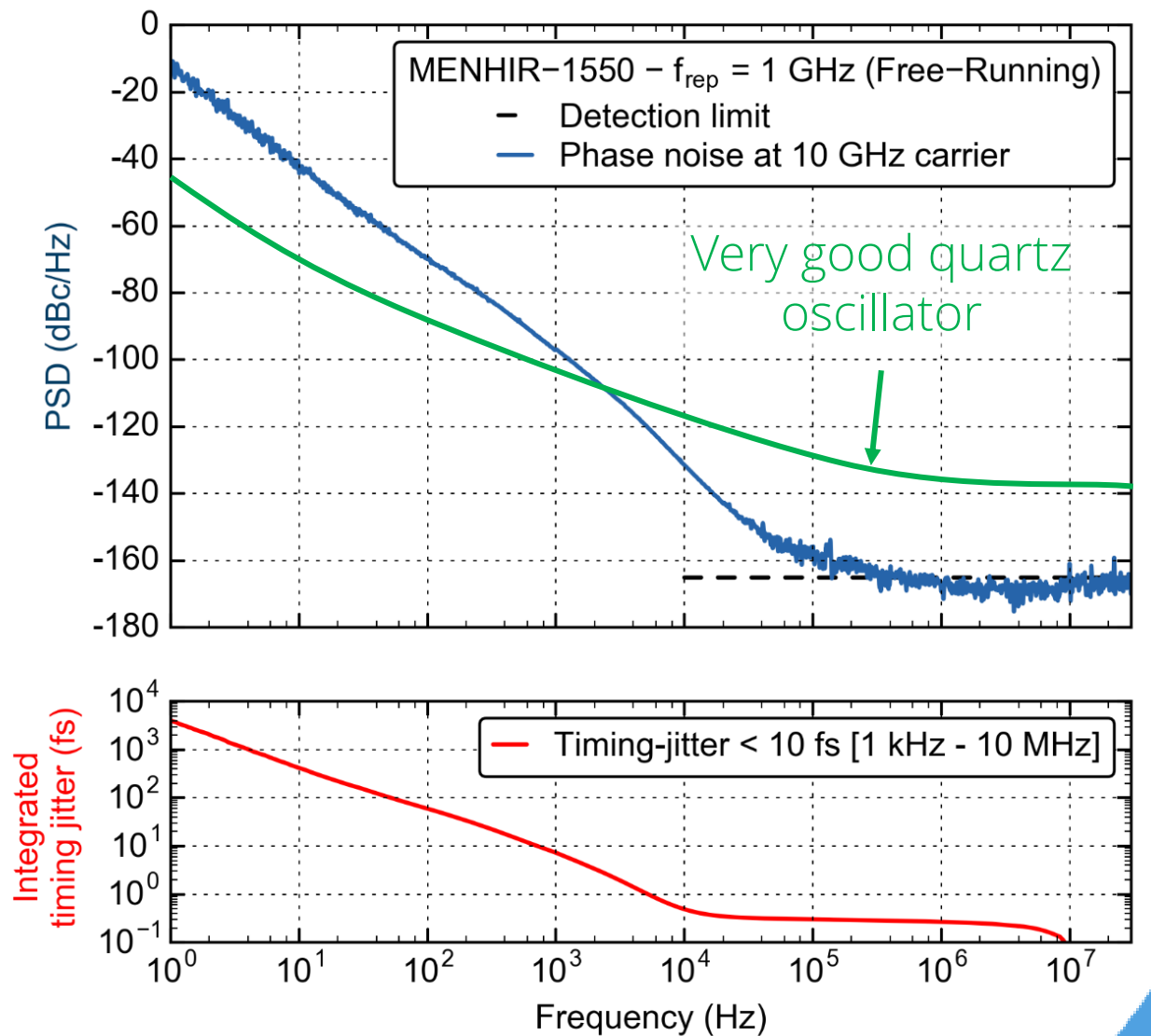
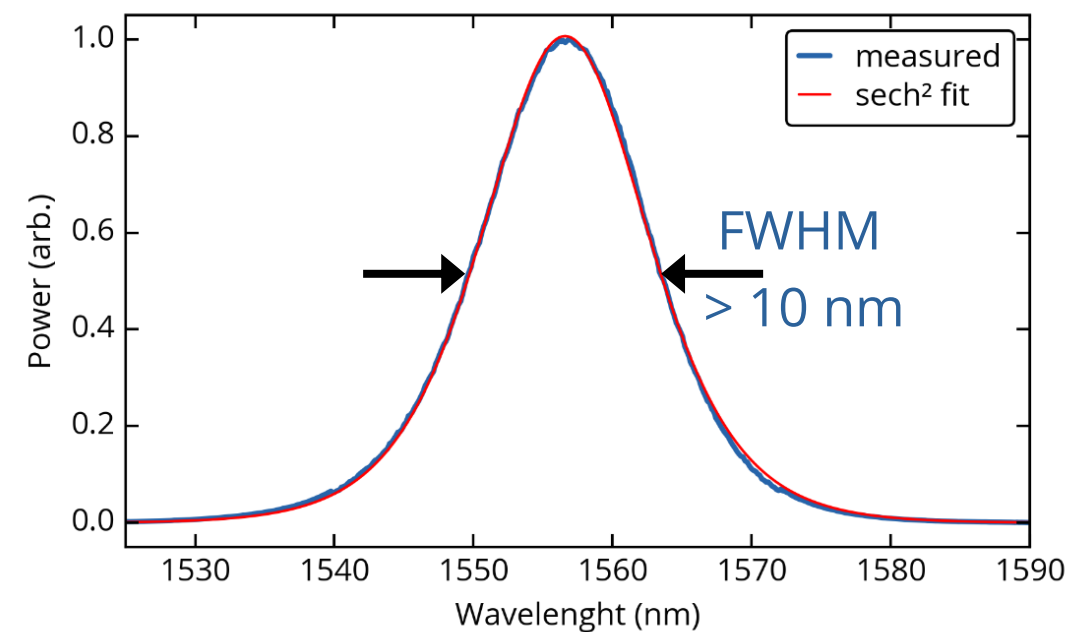
Performances

- Pulses: < 250 fs
- Wavelength: 1555 +/- 10 nm
- Bandwidth: > 10 nm
- Soliton clean pulses

Autocorrelation trace



Optical spectrum (linear scale)





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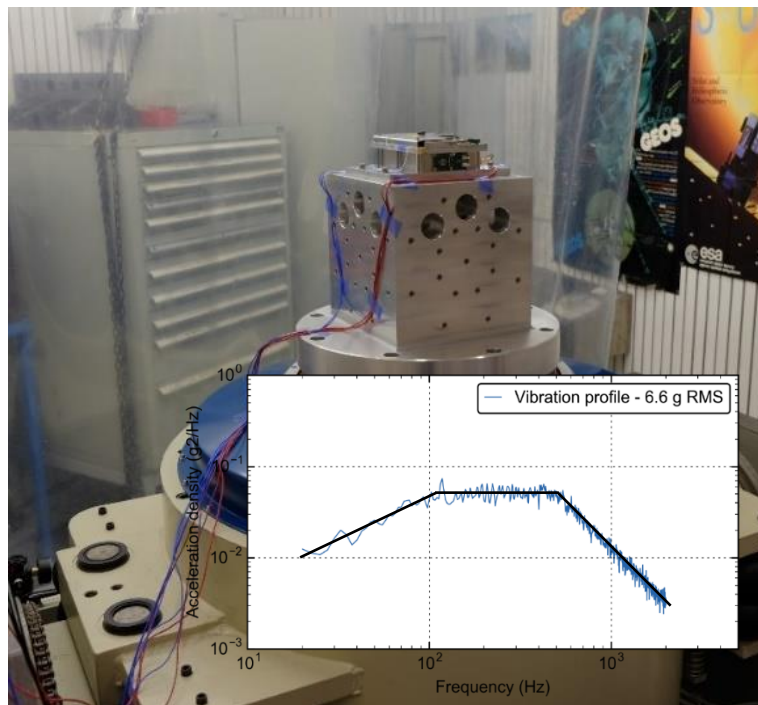
Industrial- grade femtosecond lasers

Remark: The video can be found on the [Linkedin](#) or [Twitter](#) account of Menhir Photonics AG

Extreme robustness

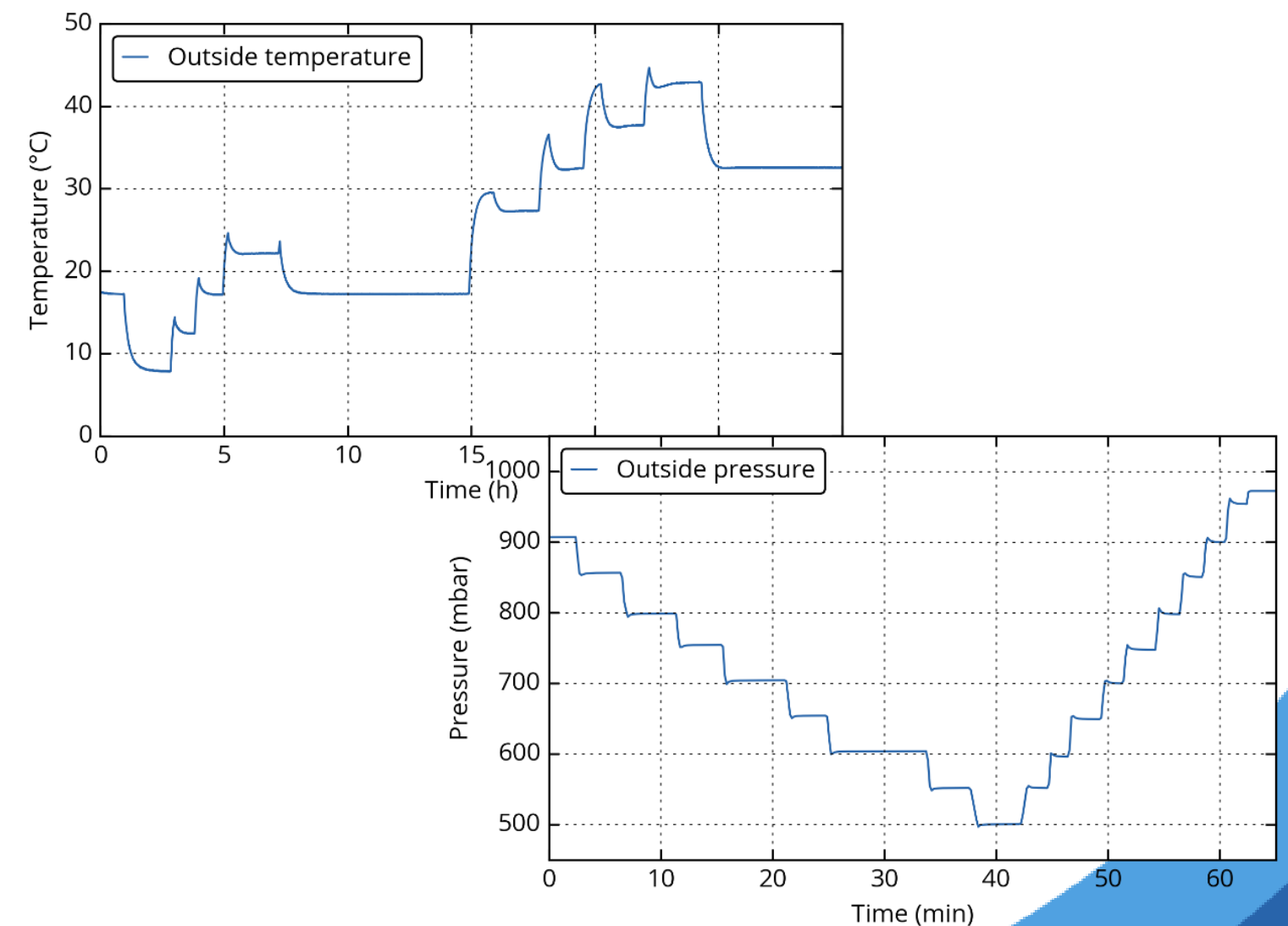
Resist to extreme conditions

- Random noise up to 6.6 g RMS
- Radiations tests up to 25 krad



Operate in a large environmental range

- Temperature range (10 – 40°C) as standard
- Pressure (500 – 1000 mbar)

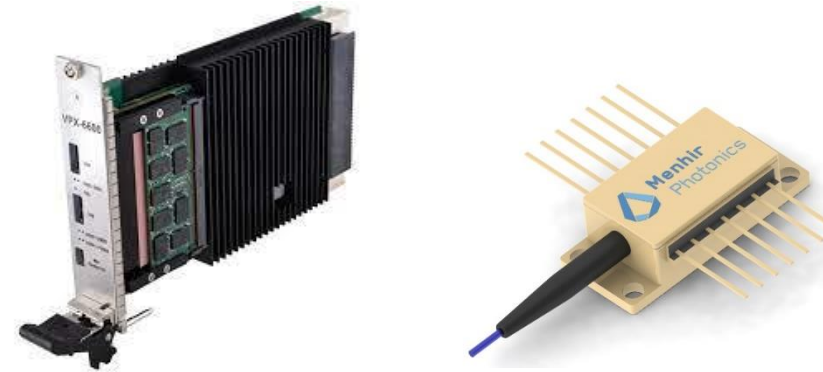
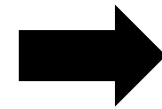


The future



2019-2024

- Ultrareliable ultrafast lasers.
- Customized manual production.



2025-2027

- Telecom grade optical oscillators.
- Standardized automated production
- Space-grade version.



Research



Spacecomm



Defense/radar



Quantum comm



Telecom backhaul



Data centers

Thank you

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