



**General Microtechnology & Photonics**  
Systems for Industry, Research, Telecom & Medicine

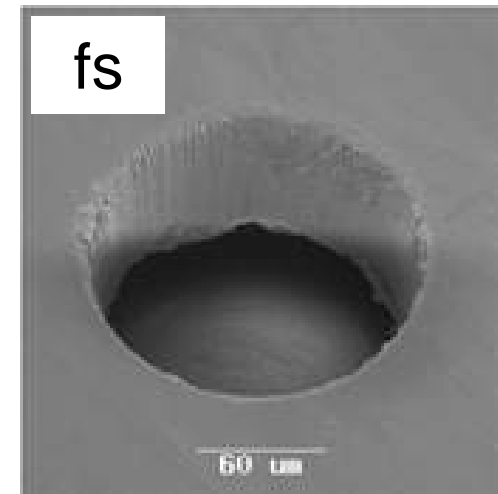
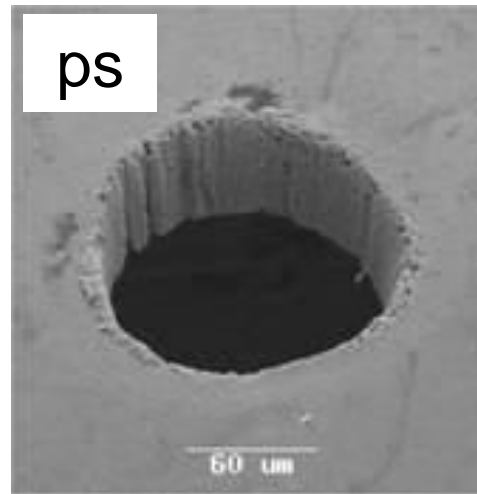
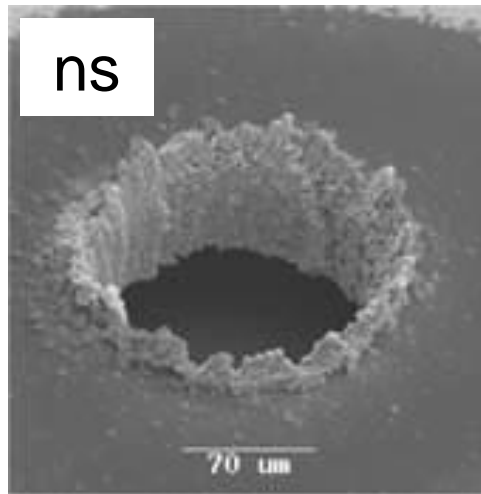
[www.gmp.ch](http://www.gmp.ch)

# Solution économique pour usinage laser picoseconde

Marcel Dubey

EPMT Lausanne, 10 juin 2010  
[marcel.dubey@gmp.ch](mailto:marcel.dubey@gmp.ch)

# Usinage laser ultrarapide



- Durée d'impulsion
- Taux de répétition
- Profile du faisceau

# Problèmes

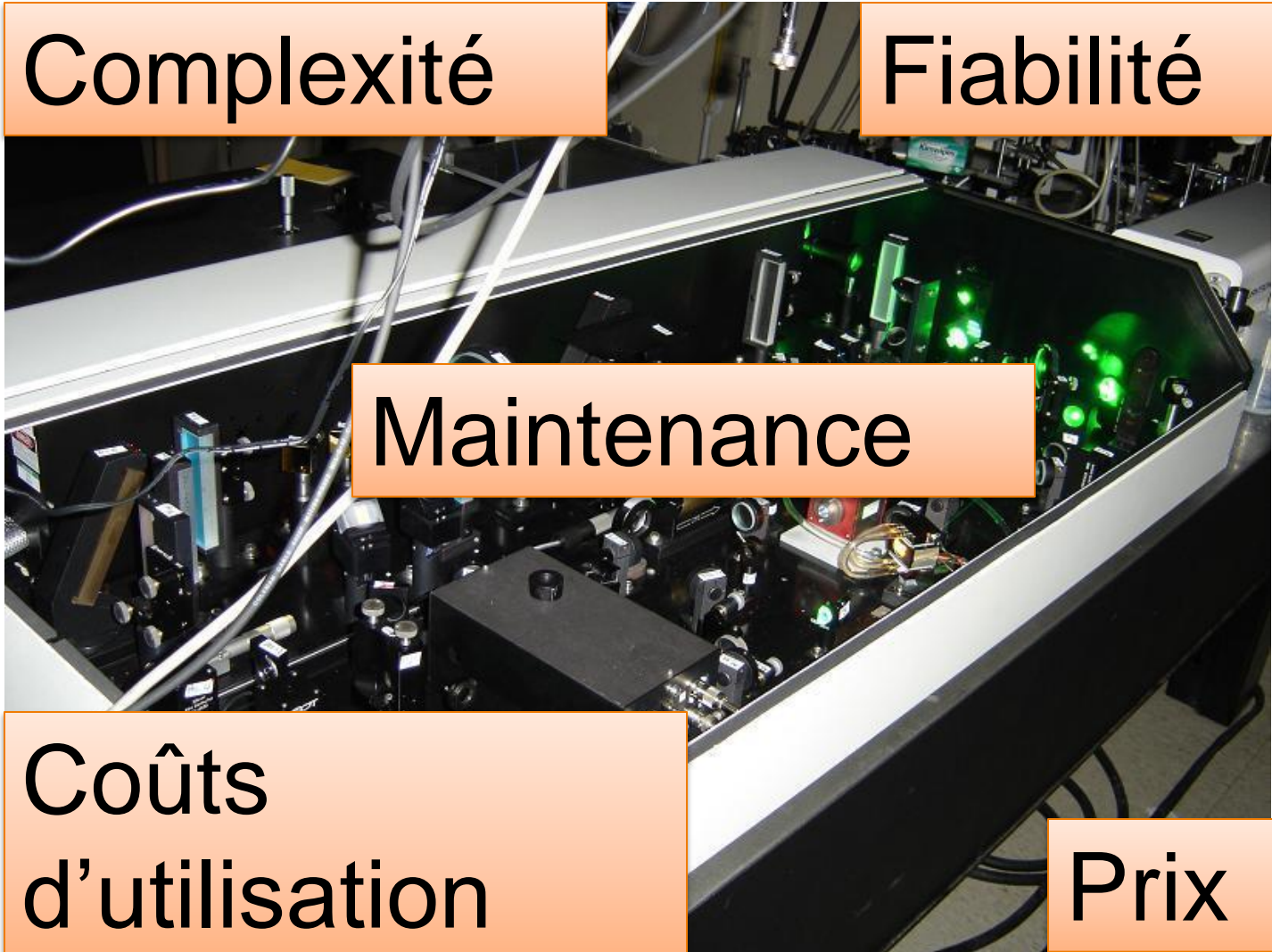
Complexité

Fiabilité

Maintenance

Coûts  
d'utilisation

Prix

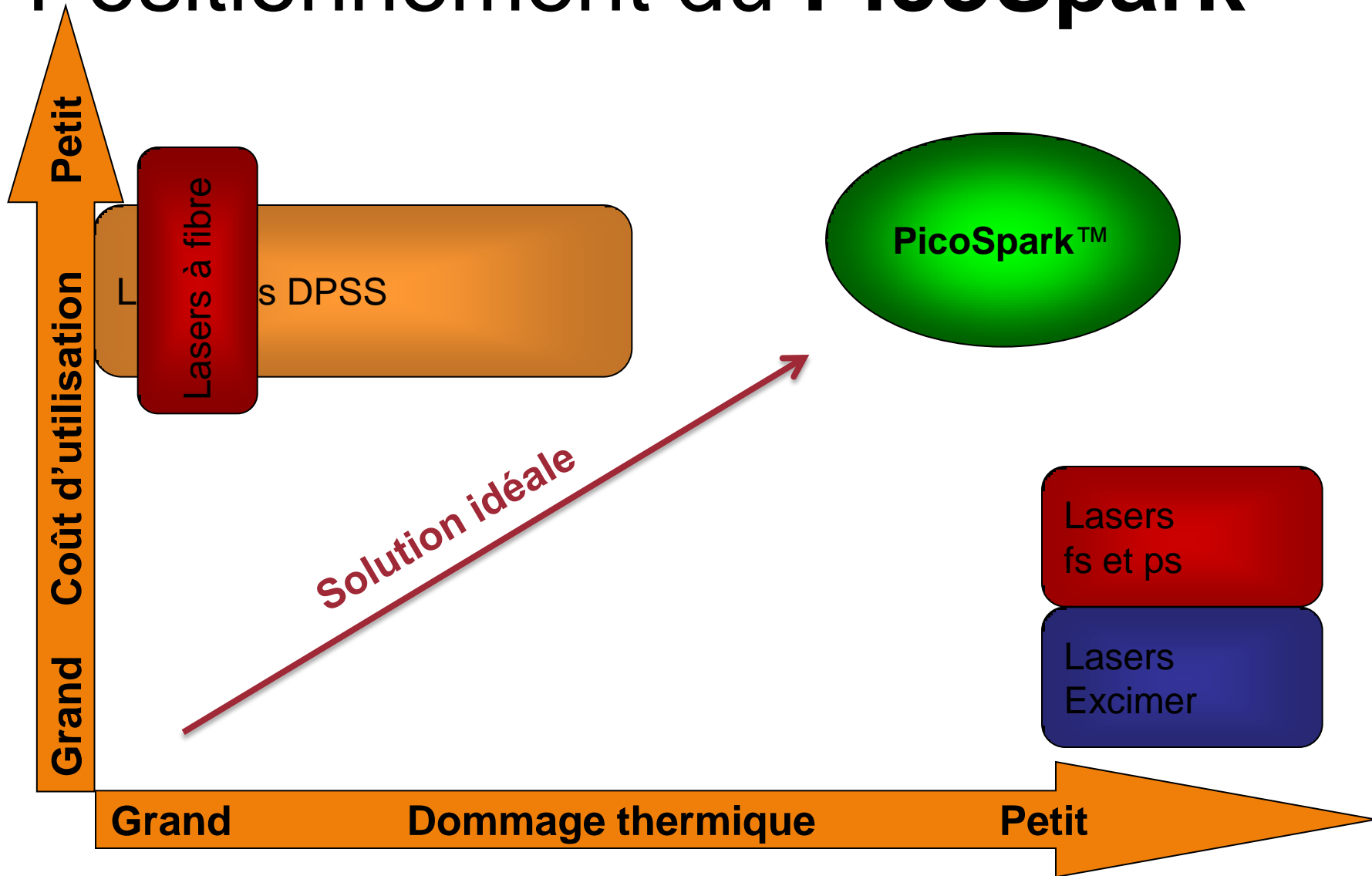


# Solution : PicoSpark

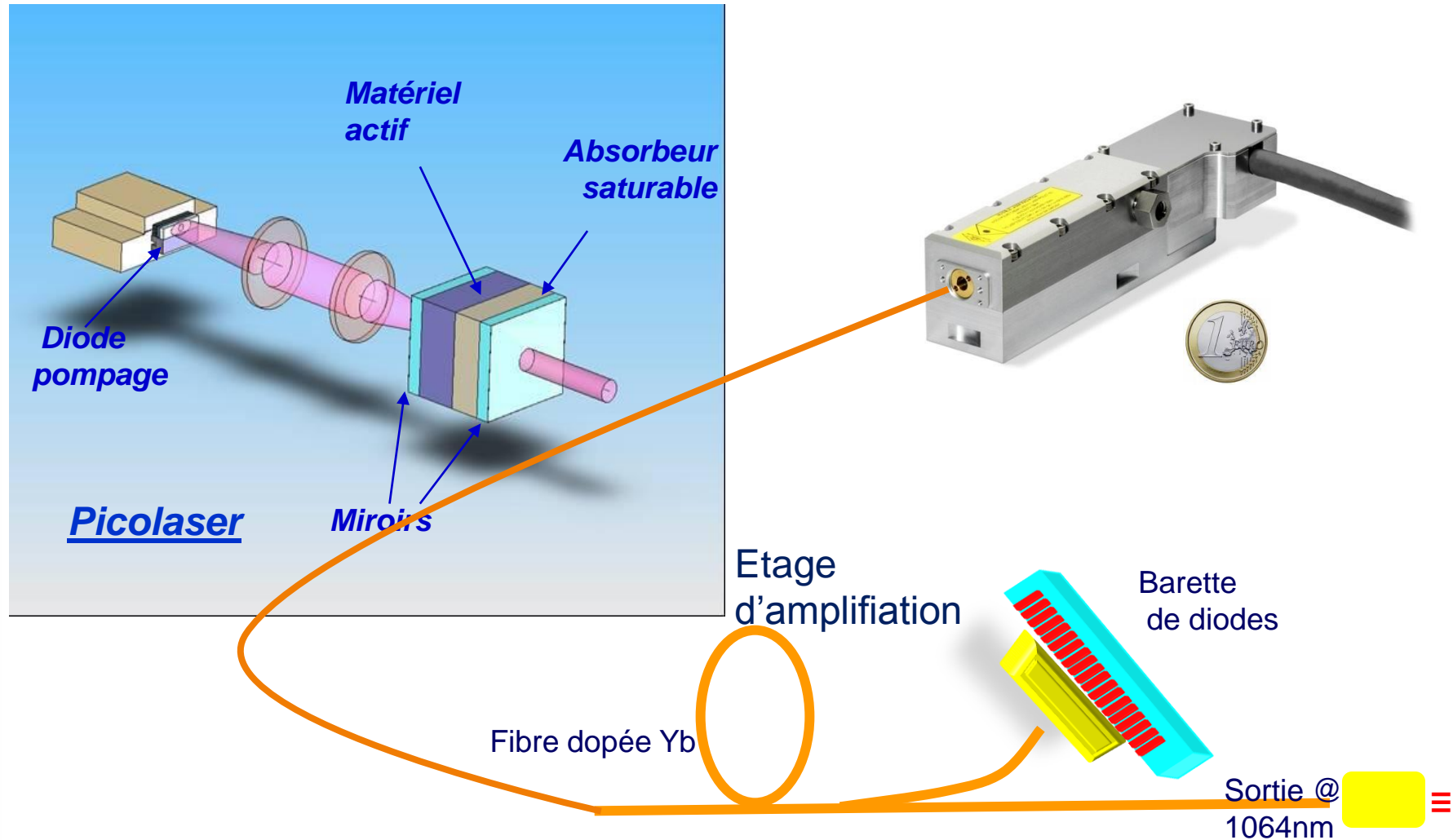


- Durée d'impulsion : centaine de ps
- Puissance crête : centaine de kW
- Irradiance crête : centaine de GW/cm<sup>2</sup>
- Longueur d'onde : 1064 nm et 532 nm

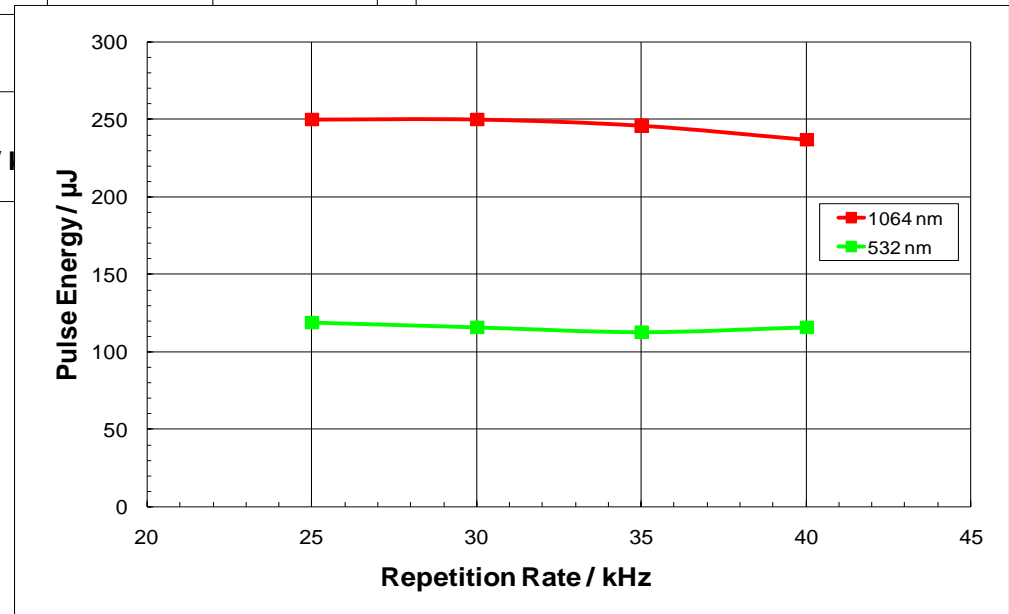
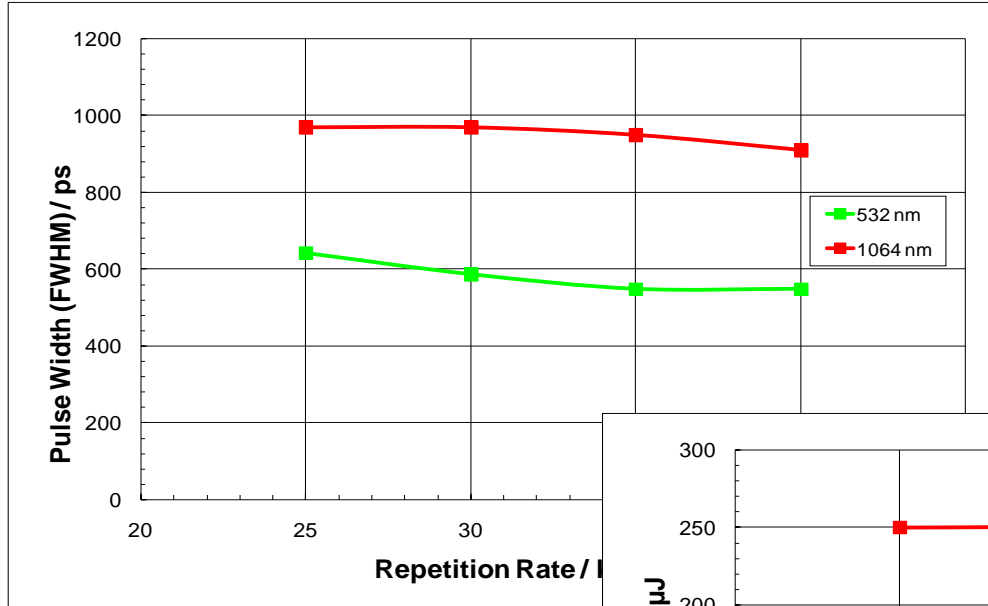
# Positionnement du PicoSpark



# Comment est-ce possible?



# Energie et durée d'impulsion maintenues

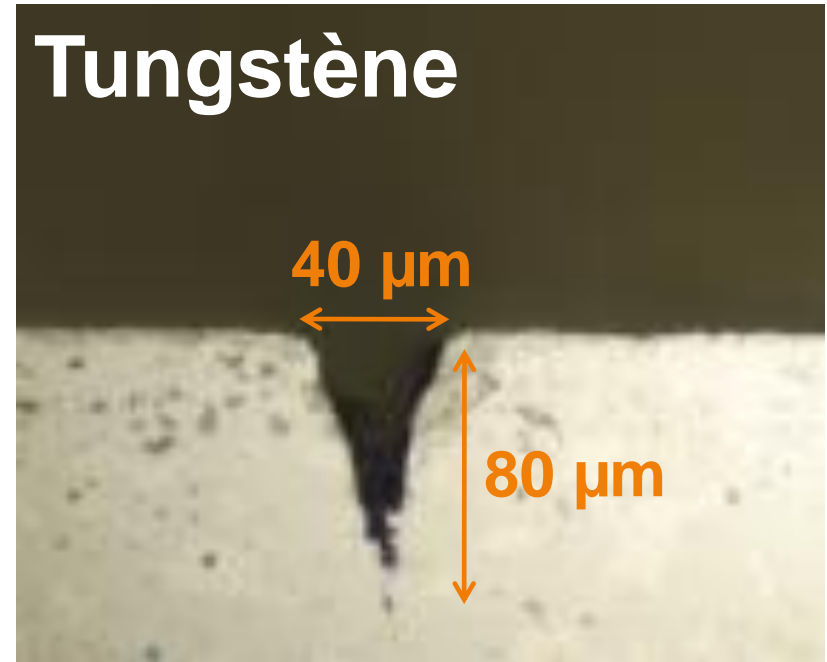
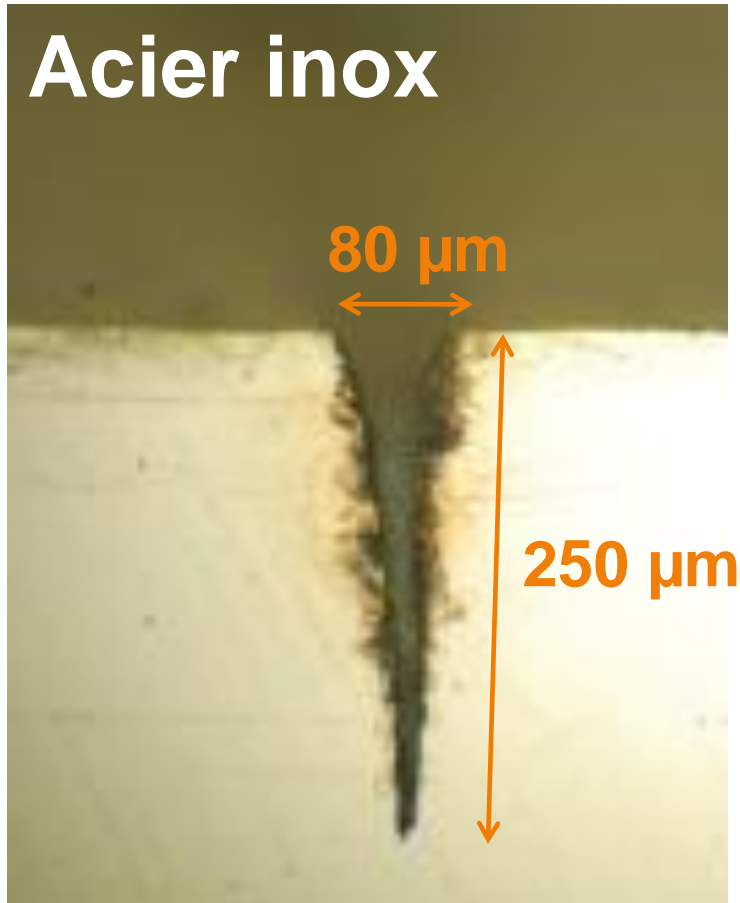


# Avantages

- Qualité du micro-usinage
- Conception simple
- Durée de vie et fiabilité
- Prix d'acquisition
- Coût d'utilisation
- Maintenance réduite
- Taille, poids

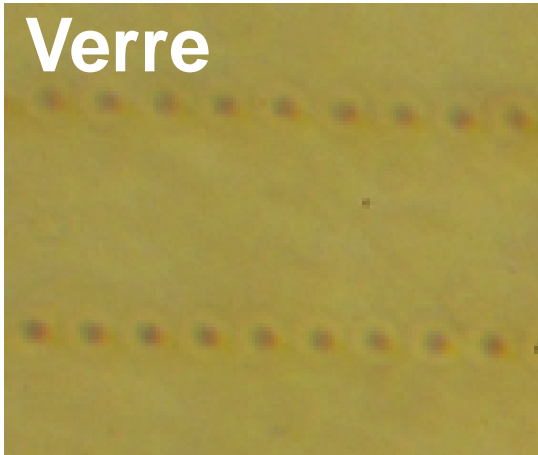


# Micro-usinage de matériaux durs

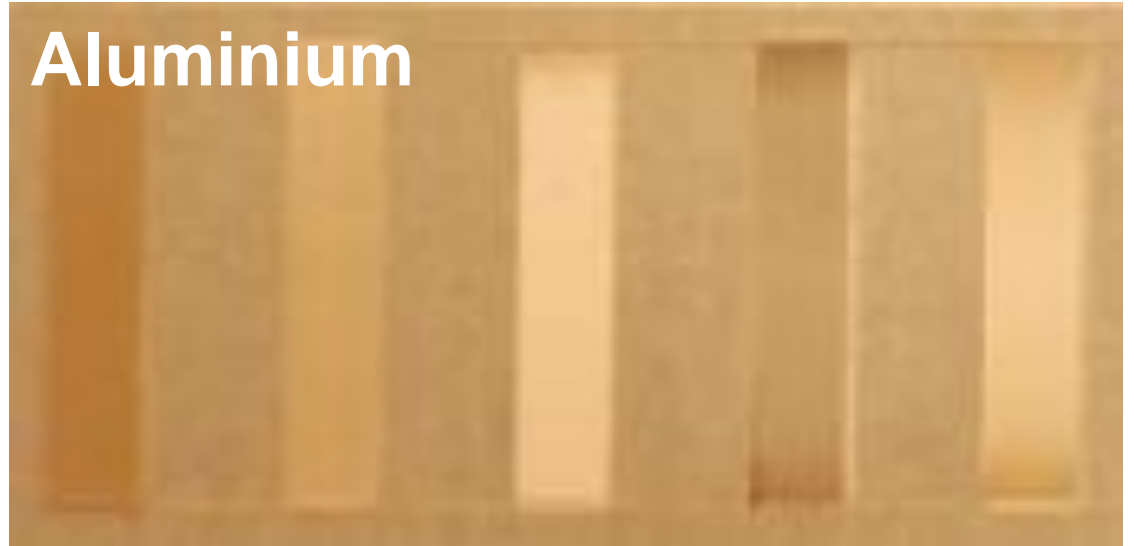


# Marquage

Verre



Aluminium



# Conclusion

- Possibilité d'effectuer du micro-usinage ultrarapide à des coûts raisonnables
  - Retour sur investissement rapide
  - Procédé fiable 24/7
- Génération économique d'impulsions courtes à haute puissance crête
  - 300 ps à 900 ps
  - Réglage flexible des cadences et puissances

# Merci

**Features & benefits**

**Ultrashort pulses that stay constant while varying rep rate or pulse energy**

As low as 500ps duration at 532nm, 900ps at 1064nm

**High peak power**

125kW per pulse, with 550GW/cm<sup>2</sup> irradiance, at 532nm; 250kW per pulse, with 700GW/cm<sup>2</sup> irradiance, at 1064nm

**Variable Repetition rate**

Adjustable from 20kHz to 40kHz

**Adjustable pulse energy**

Pulse energy turned on in <300us, turned off in <600us

**Excellent beam quality**

Gaussian, TEM00, M<sup>2</sup>≤1.4

**Efficient, air cooled**

Typically consumes <350W

**Licensed Technology**

Exclusive license on Passively Q-switched pico-second microchip lasers: US Patent 5394413

License on fiber lasers and amplifiers: US Patent 5818630

**CDRH compliant**

**Optional features**

**Increased pulse energy** by relaxing M<sup>2</sup> or, at 1064nm, by removing isolator

**1064nm & 532nm Passively Q-Switched Nd:YAG lasers: high irradiance, multiwatt**

PicoSpark™ brings together Passively Q-Switched (PQS) microchip laser technology with fiber amplification, resulting in a multiwatt laser that generates pulses with hundreds of kilowatt peak power and hundreds of gigawatt per square centimeter irradiance.

A PQS microchip laser is the seed of PicoSpark™ and sets the pulse width, while allowing the user to vary the pulse energy (or peak power) and the repetition rate independently of each other. The output is free-space coupled, preserving peak power and beam quality.

The PicoSpark™ HNP series emits 5.5W at 1064nm; the HNG series emits 3.5W at 532nm, generated by harmonic conversion, both with an M<sup>2</sup> of 1.4 or lower.



Fiches techniques disponibles à la sortie

**PicoSpark™ HNX lasers**

Model	HNP-06P-100	HNG-03P-100
Wavelength (nm)	1064	532
M <sup>2</sup>	1.3	1.3
Energy/Pulse (µJ)	200	100
Pulse Width (ps)	900	600
Peak Power (kW)	220	170
Repetition rate (kHz)	20-40	20-40
Average Power (W)	5.5	3

Typical values

**Applications**

- ▶ Micromachining
  - Scribing silicon and sapphire
  - Edge isolation
  - Drilling in steel
  - Ablation of copper
  - Cutting of tungsten
- ▶ Marking
  - Glass inscribing
  - Diamond graphitization
- ▶ Instrumentation
  - Laser Induced Breakdown Spectroscopy
  - Raman spectroscopy
  - Supercontinuum generation
  - Ranging
  - Differential absorption LIDAR
- ▶ Biophotonics
  - Microsurgery
  - Dense tissue ablation
  - Tattoo removal

Stand D3, halle 9

[www.gmp.ch](http://www.gmp.ch)

GMP SA Siège principal : Avenue des Baumettes 17 CH-1020 Renens Tel. 021 633 21 21 Fax. 021 633 21 29 Info@gmp.ch  
 GMP SA Succursale de Zürich : Dübendorferstrasse 11a CH-6117 Fällanden Tel. 044 825 34 00 Fax. 044 825 34 01 Info@gmp.ch

Marcel Dubey  
 marcel.dubey@gmp.ch