

Ultrafast rare-earth-doped fiber laser: do it yourself

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INNOVATIVE ECONOMY
NATIONAL COHESION STRATEGY

EUROPEAN UNION
EUROPEAN REGIONAL
DEVELOPMENT FUND



Why fibers?

- High efficiency (laser diode pumping)
- Low cost (using telecom components)
- Simplicity
- No dust on mirrors



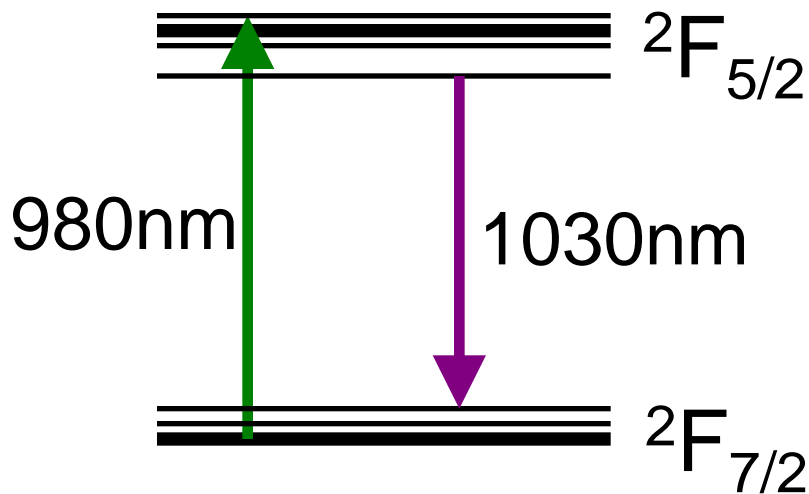
Applications

- Supercontinuum generation
- Ultrafast spectroscopy
- Telecommunications
- Frequency combs
- Material processing
- ...

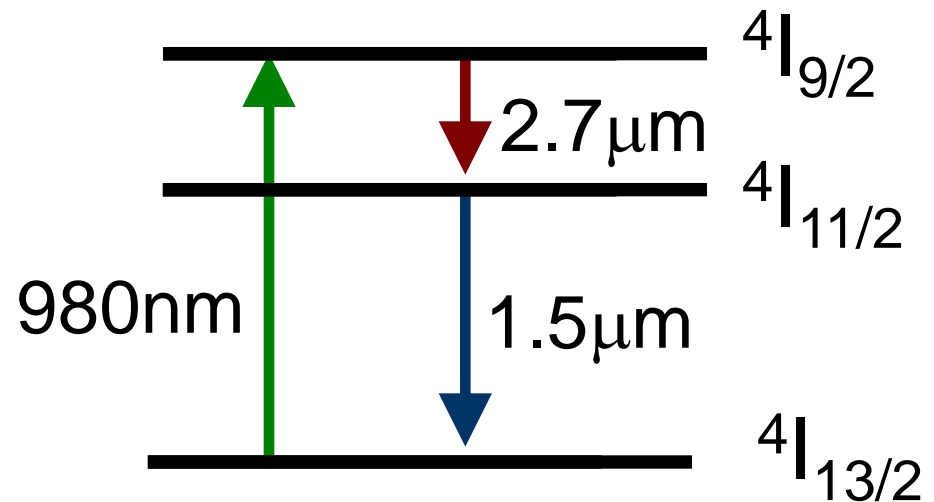


Laser transitions

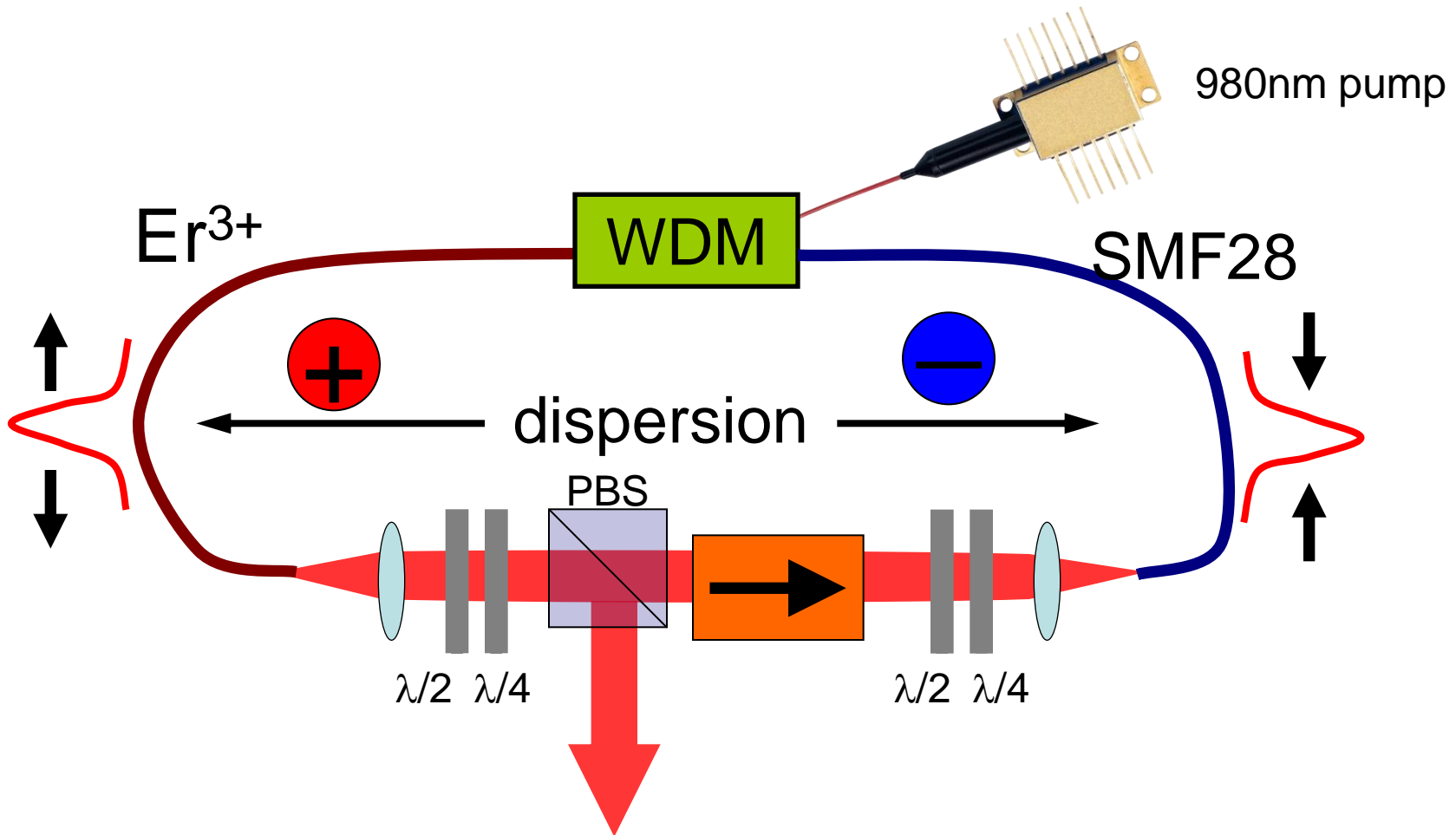
Yb³⁺



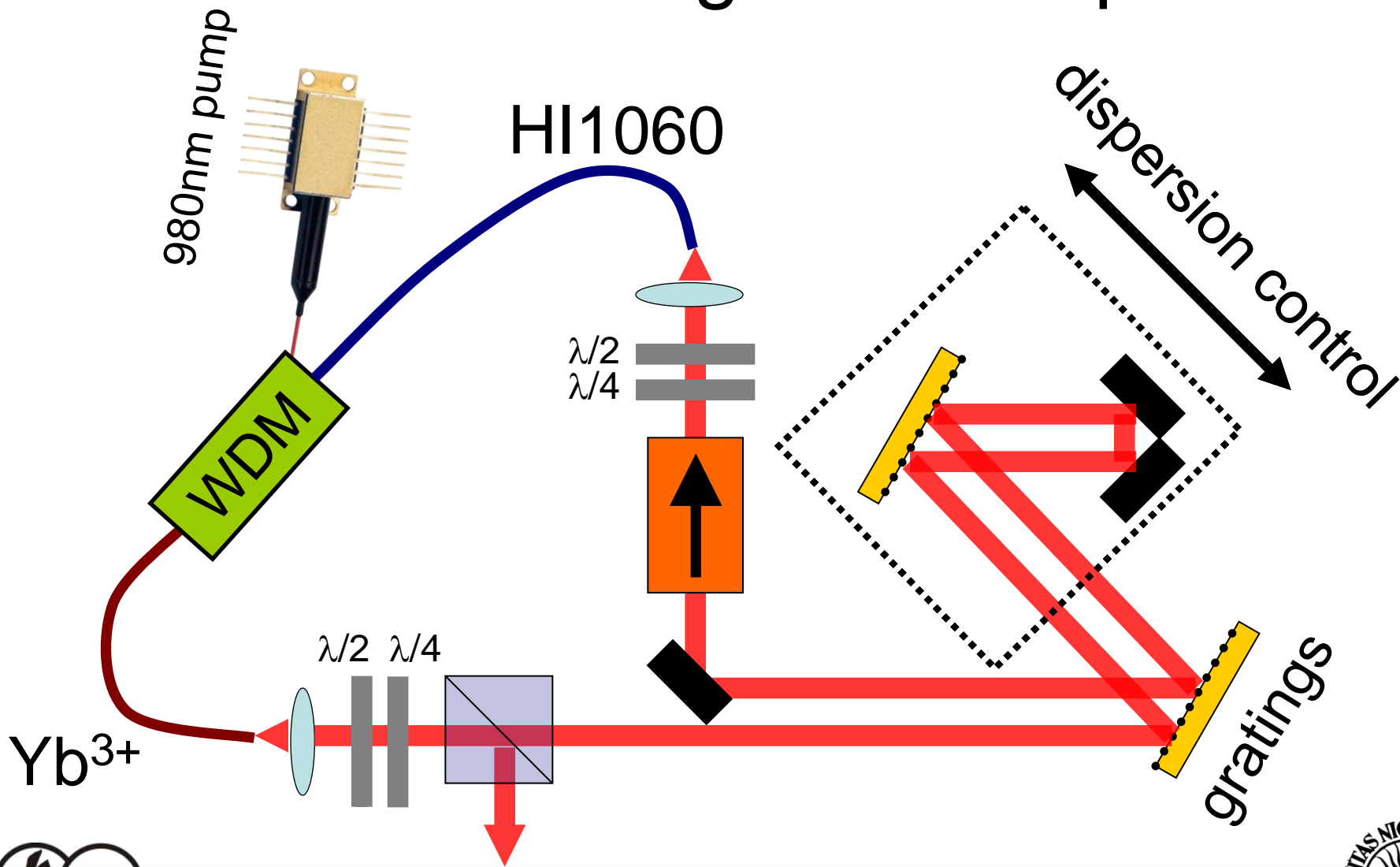
Er³⁺



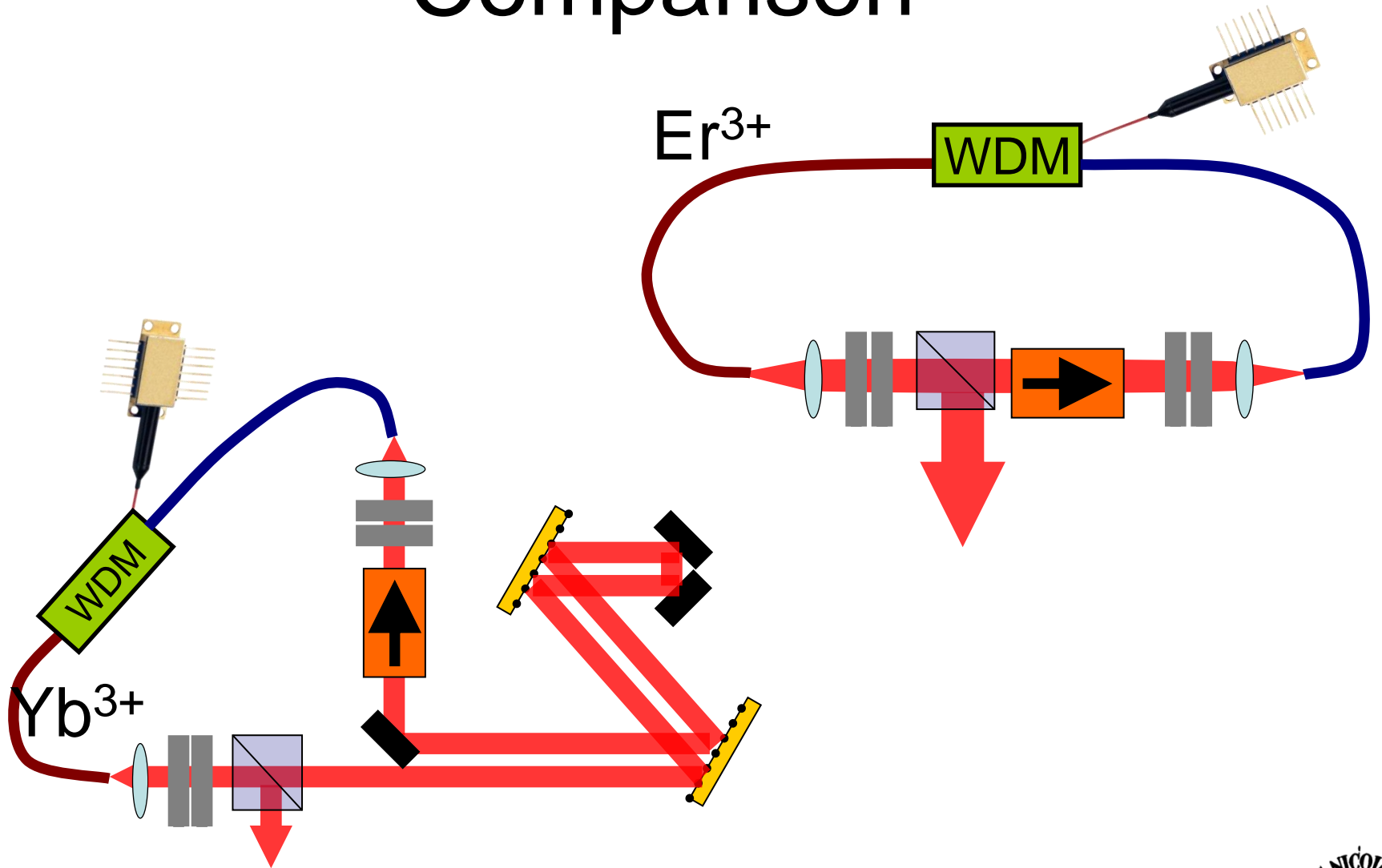
Unidirectional ring laser



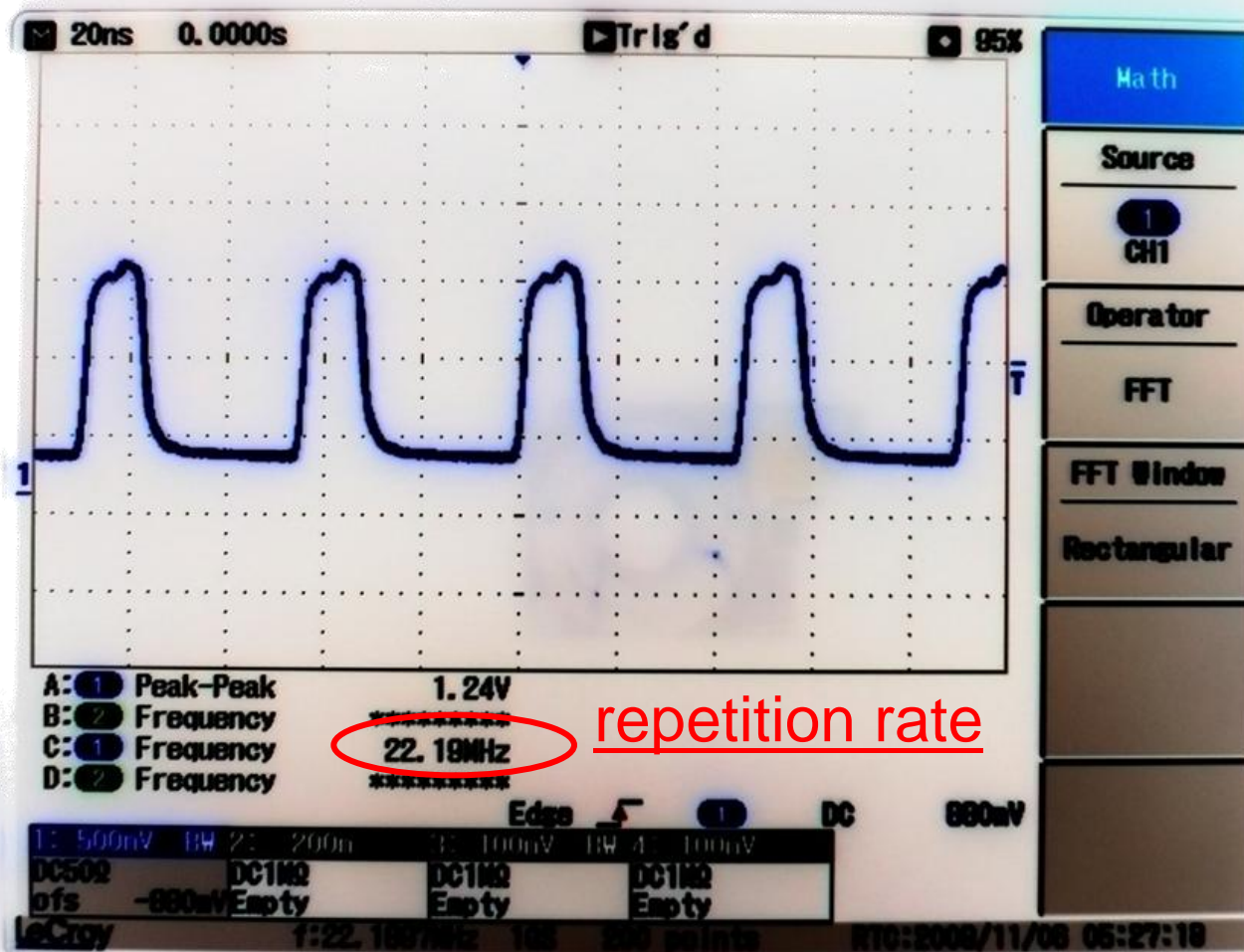
Unidirectional ring with compressor



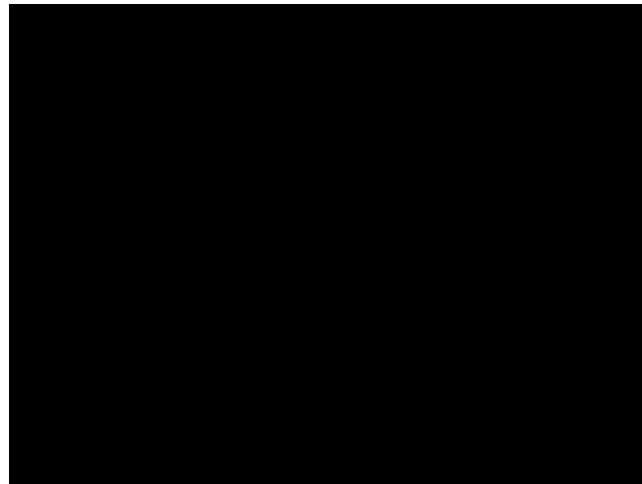
Comparison



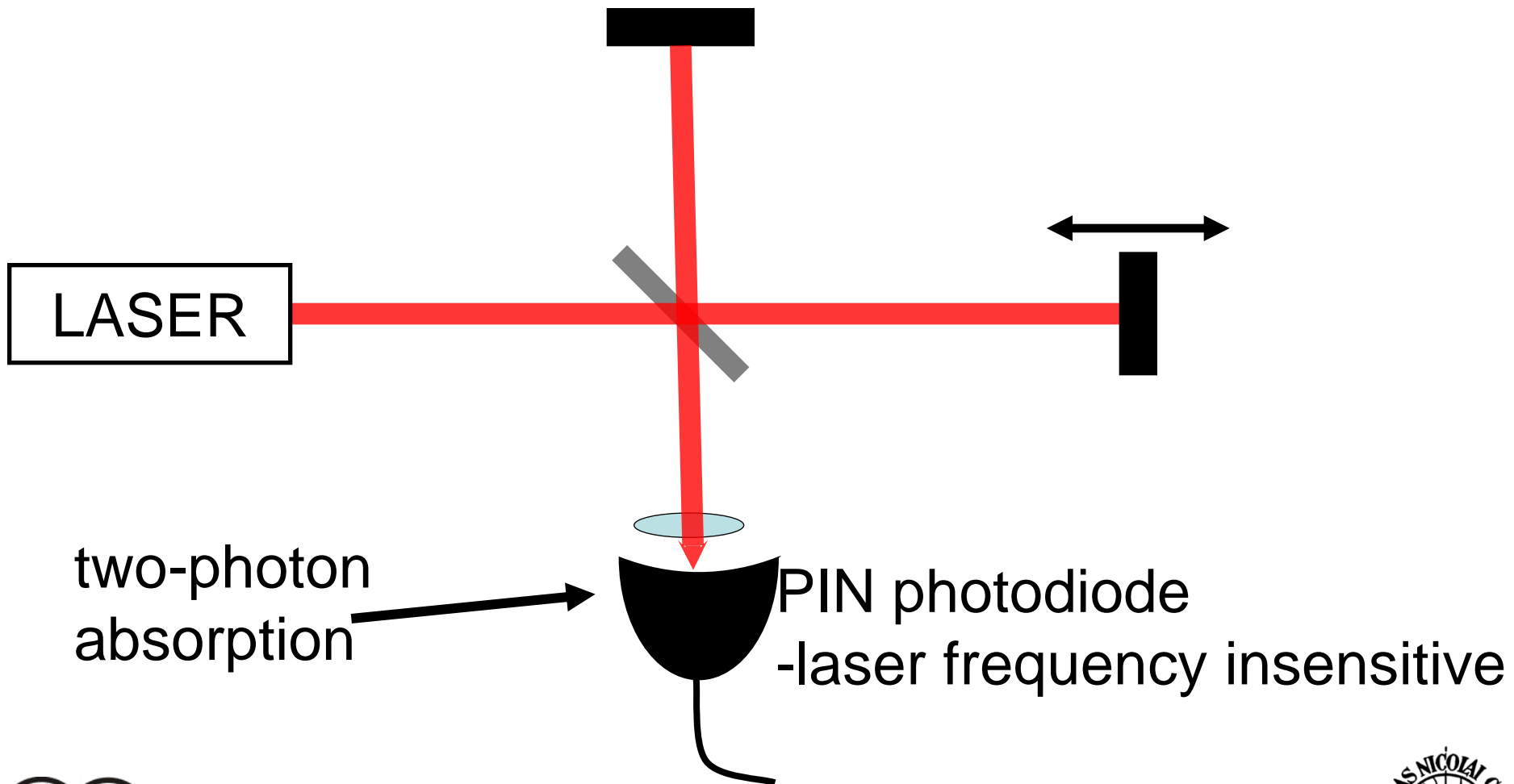
Oscilloscope trace from PIN photodiode



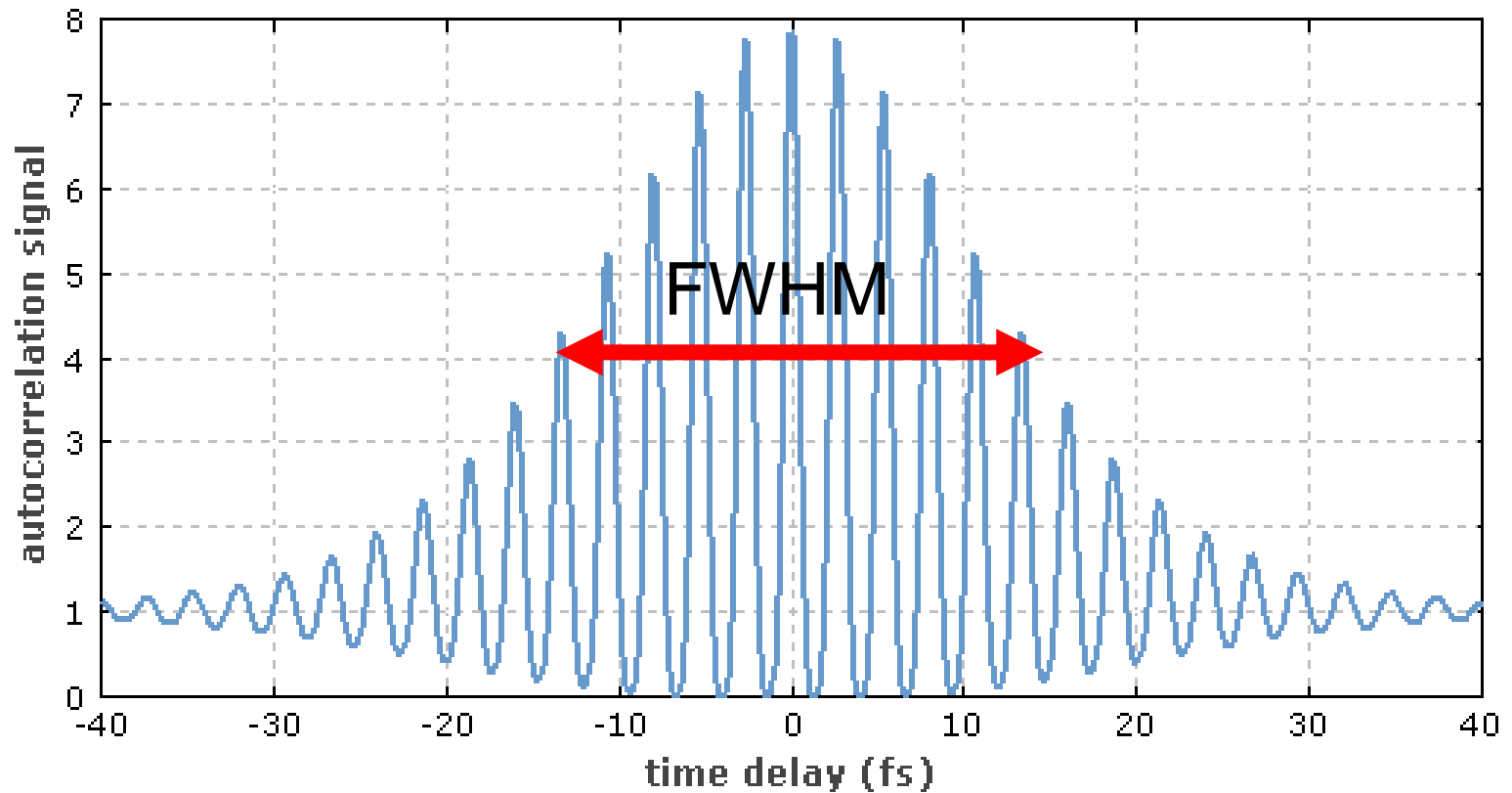
Misaligned waveplates
→ multiple pulses in a cavity



Autocorrelator



Autocorrelation signal



Fusion splicing



Summary: what do we need?

- Fibers: Rare-earth doped and normal one
- Pump laser diode and power supply
- WDM
- Optical isolator
- Compressor (in case of Yb)
- Polarizing beamsplitter
- Fusion splicer (useful, but not necessary)

