Increasing the Sensitivity of Electro-optic Sampling Using Brewster Plates: Application to Photonic Time Stretch

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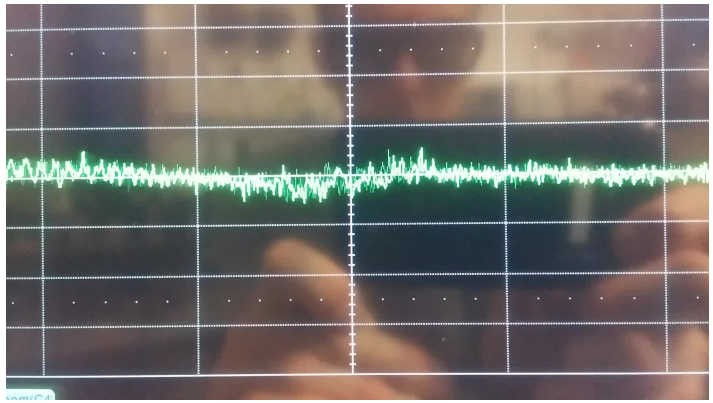
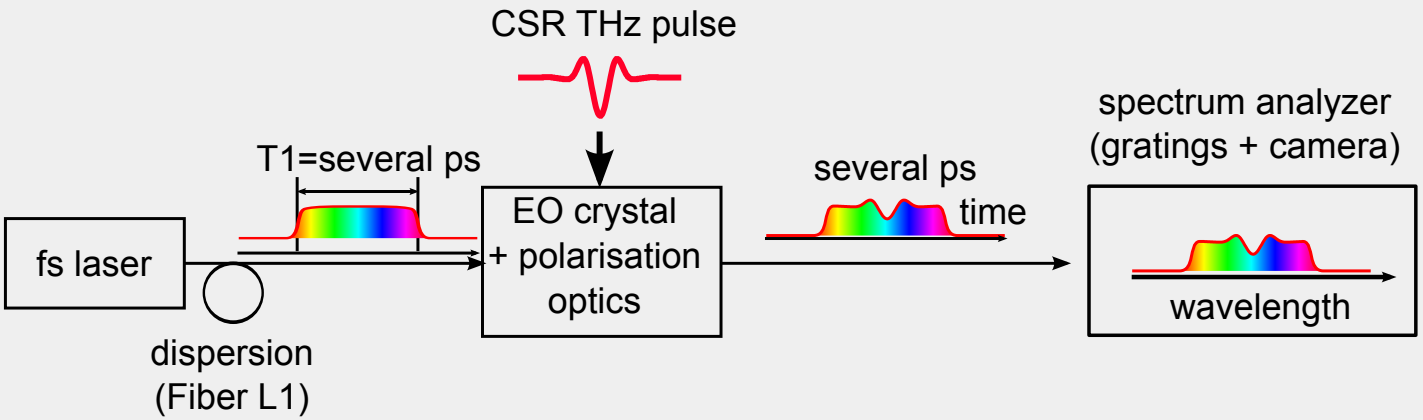
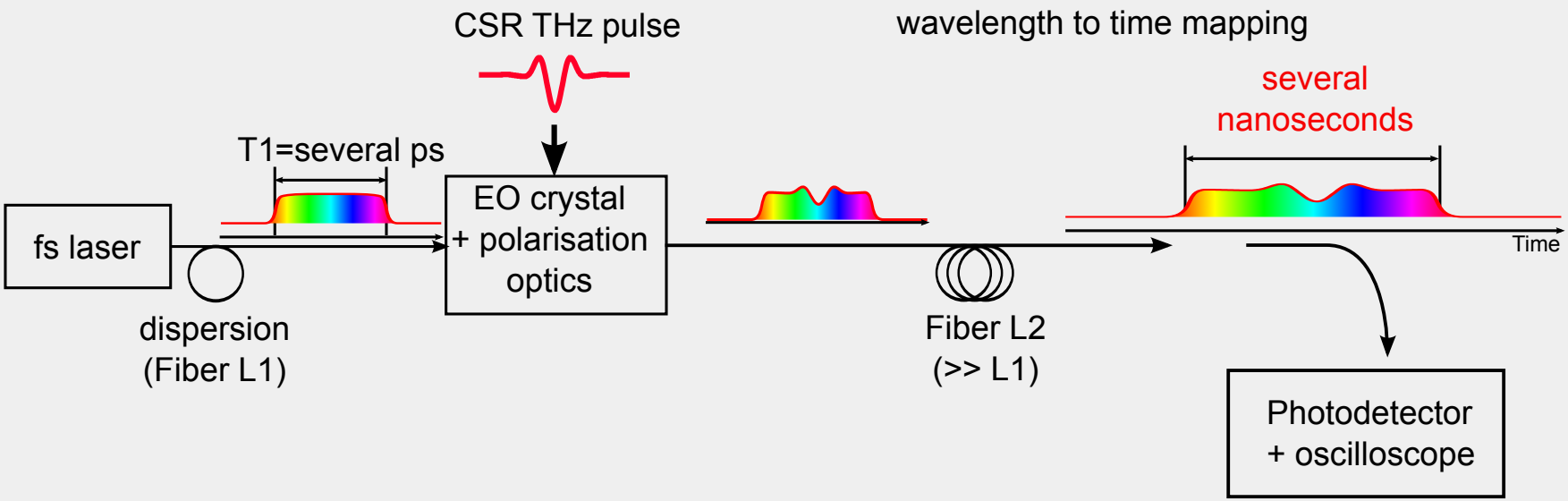


Single-shot EO sampling

Time → spectrum conversion

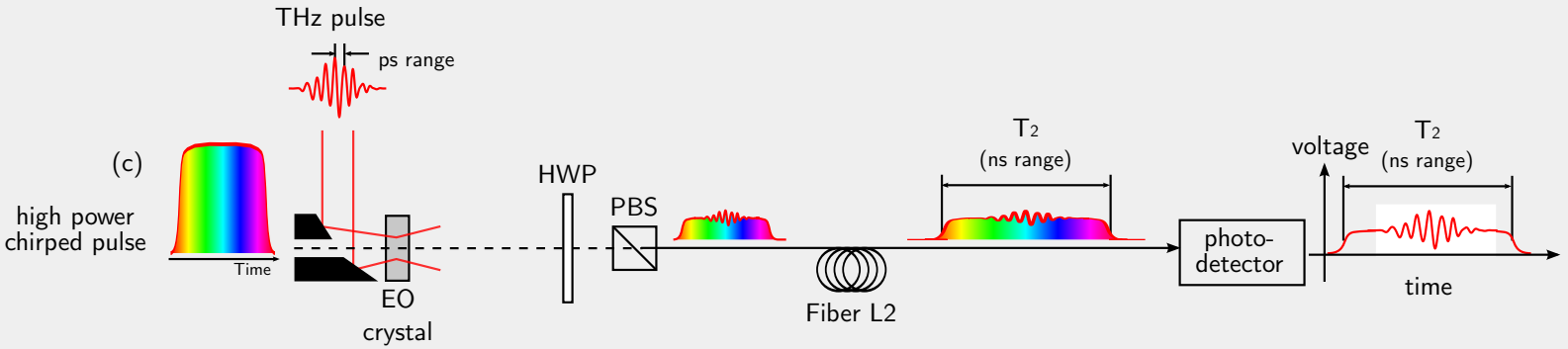


Time → spectrum → time conversion

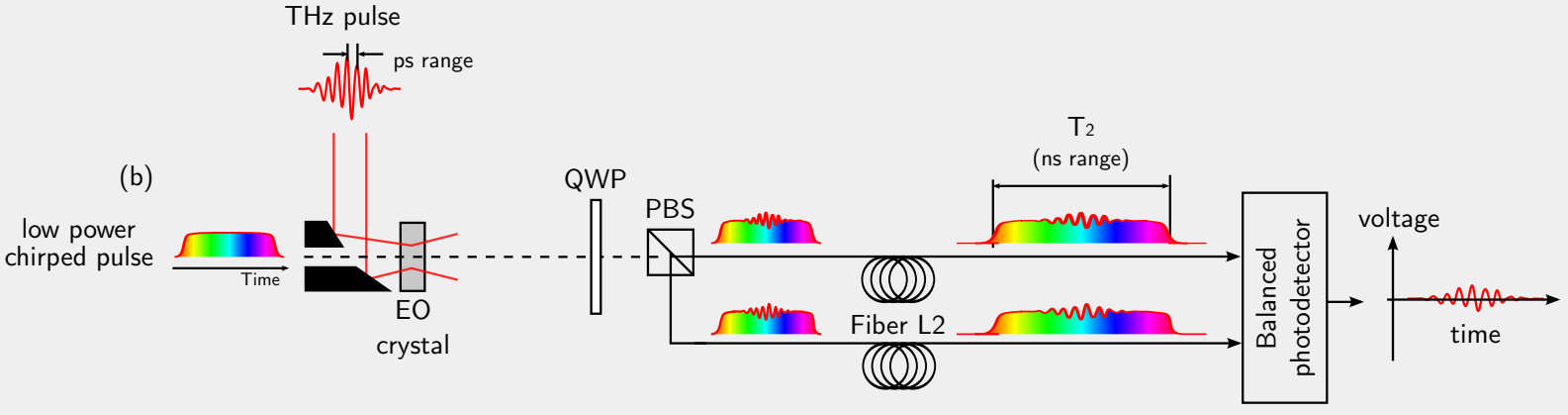


Single-shot EOS: how to optimize signal-to-noise ratio?

EO crystal between polarizers "close to extinction": High responsivity

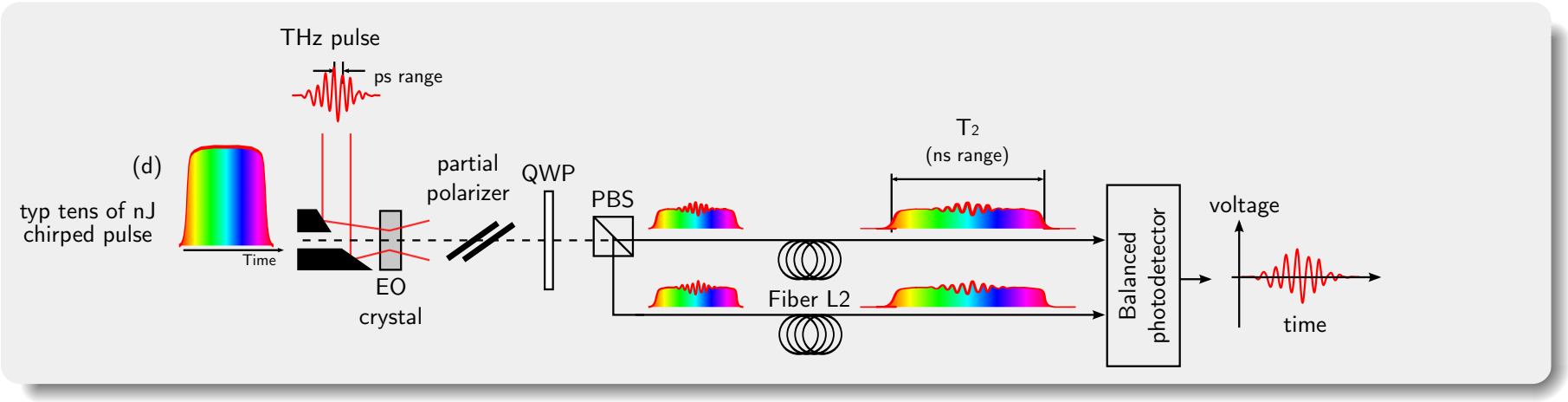


Balanced detection between the two polarizer ports: Laser noise cancellation



- Incompatible strategies?

Setup for single-shot recording of radiated THz pulses (tested at SOLEIL)



- Balanced detection for noise cancellation (laser and ASE)
- Introduction of Brewster plates (with transmission T) allows the sensitivity to be increased by an arbitrary factor $1/\sqrt{T}$. [Ahmed *et al.*, Rev. Sci. Instr. 85, 013114 (2015)].