



GEMINI 2D

INTERFEROMETER



for time-resolved measurements

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The GEMINI 2D is the advanced model of the GEMINI interferometer. It is a compact and ultra-stable interferometer, capable of generating a pair of **collinear and phase-locked replicas of ultra-short pulses**, with unrivaled stability and robustness.

The GEMINI 2D is specially designed to:

- keep constant the **dispersion** introduced during the scan of the delay between the two replicas
 - keep fixed the **absolute arrival time** of one of the two replicas (with attosecond stability)
- High throughput
- 1 attosecond stability
- Scan range selectable by the user
- Compact and insensitive to vibrations

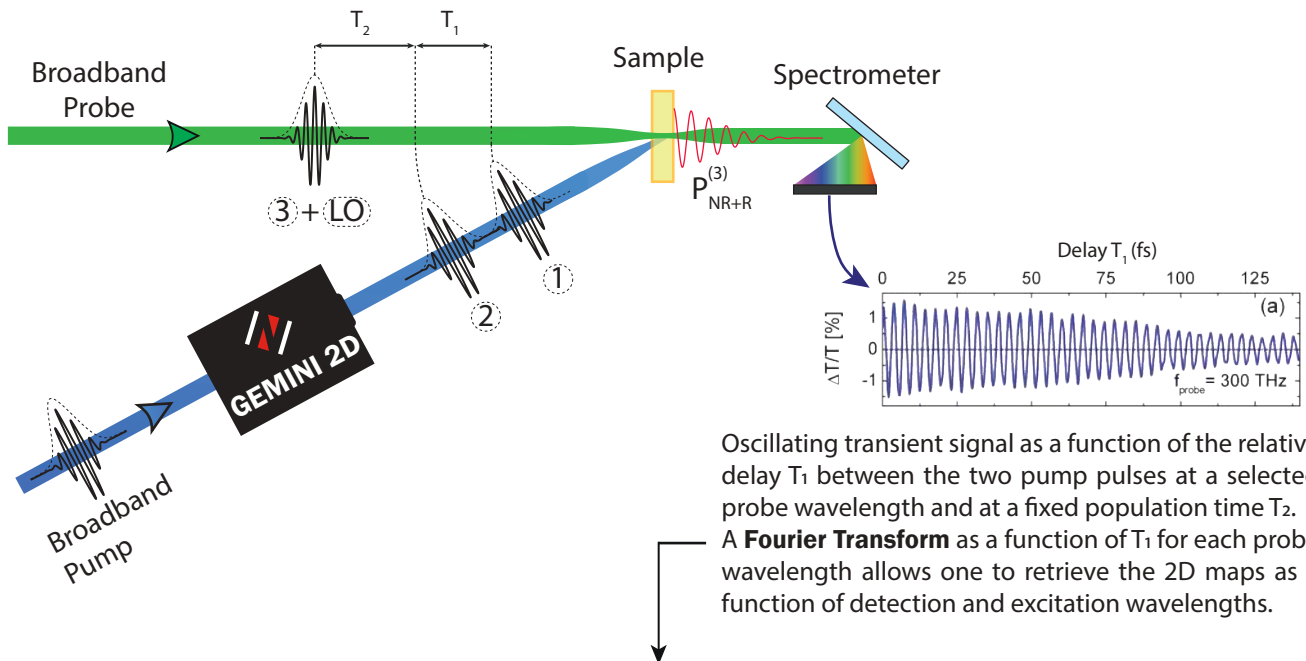
Main Applications

The GEMINI 2D is the ideal device for **time-resolved measurements**, where it is crucial to preserve the pulse duration and the synchronization with other light pulses.

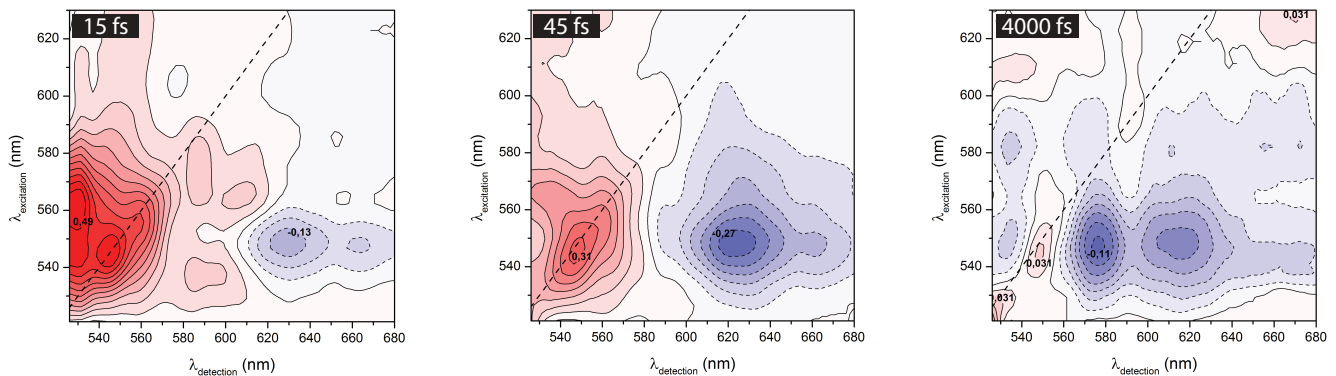
Perfectly suitable for **two-dimensional (2D) spectroscopy experiments**, to generate a pair of collinear and phase-locked pump pulses



Two-dimensional Spectroscopy (in pump-probe geometry)



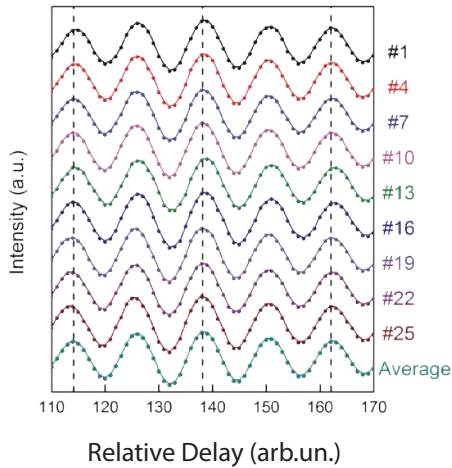
Bidimensional maps of 2D Electronic Spectroscopy measurements obtained on a Light Harvesting (LH1) complex of a sample of *Rhodospirillum Rubrum* for three different population times T_2 (15 fs, 45 fs, 4000 fs).



- The GEMINI 2D interferometer is placed in the pump beam before the sample, allowing one to generate two collinear and phase-locked pump pulses (1 and 2) with a relative variable delay T_1 (coherence time).
- The absolute arrival time of pulse 2 is kept fixed in order not to change the delay T_2 (population time) during the scan of T_1 .
- In the pump-probe geometry, the rephasing and non-rephasing signals - $P_{NR+R}^{(3)}$ - are emitted in the same direction as the probe (3), which also acts as a local oscillator (LO) that heterodynes them on the detector.

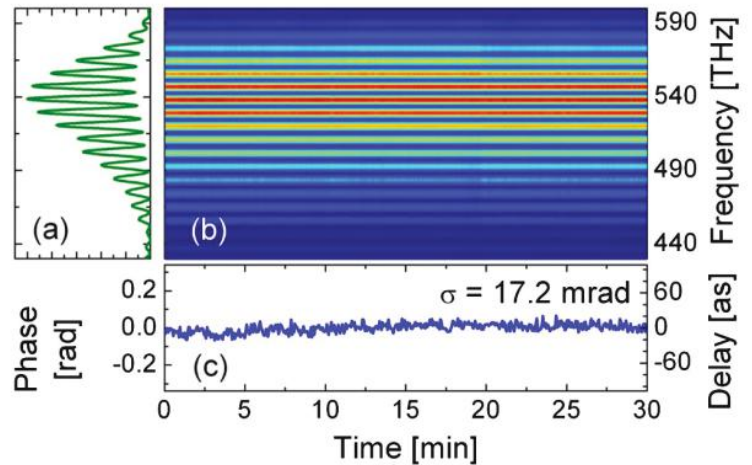
Performances

REPEATABILITY TEST



Interference patterns between the two replicas generated by the GEMINI 2D Interferometer, measured for different scan number indicated on the right. The lower one is the average of 40 scans. The measurements show an **exceptional repeatability!**

STABILITY TEST

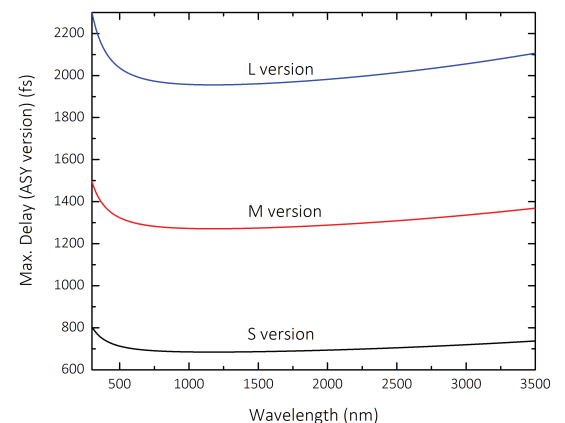


(a) Fringe pattern generated by the interference of the two replicas created by the GEMINI 2D Interferometer; (b) sequence of fringe patterns acquired by keeping the relative delay fixed for 30 min; and (c) corresponding phase fluctuations. The **phase jitter is less than 1/360th of the optical cycle.**

Technical Specifications

| VERSION | | S | M | L |
|---|-----|-------------------------------|-------------------------|-------------------------|
| Spectral range [nm] | | 250 - 3500 | | |
| Max. Delay τ [fs @ $\lambda=600$ nm] | SYM | ± 400 | ± 700 | ± 1050 |
| | ASY | -100 \rightarrow 700 | -100 \rightarrow 1300 | -100 \rightarrow 2000 |
| Delay τ Stability | | < 1 attosecond | | |
| Modes of Operation | | Continuous Scan or Step Scan* | | |
| Dimensions [mm] | | 180 x 180 x 90 | | |
| Weight [kg] | | 3 | | |

*In step scan mode, the user can select the dwell time for each delay via software



Maximum delay relative to the asymmetric (ASY) configuration achievable with the three different models (S, M and L) as a function of wavelength.