

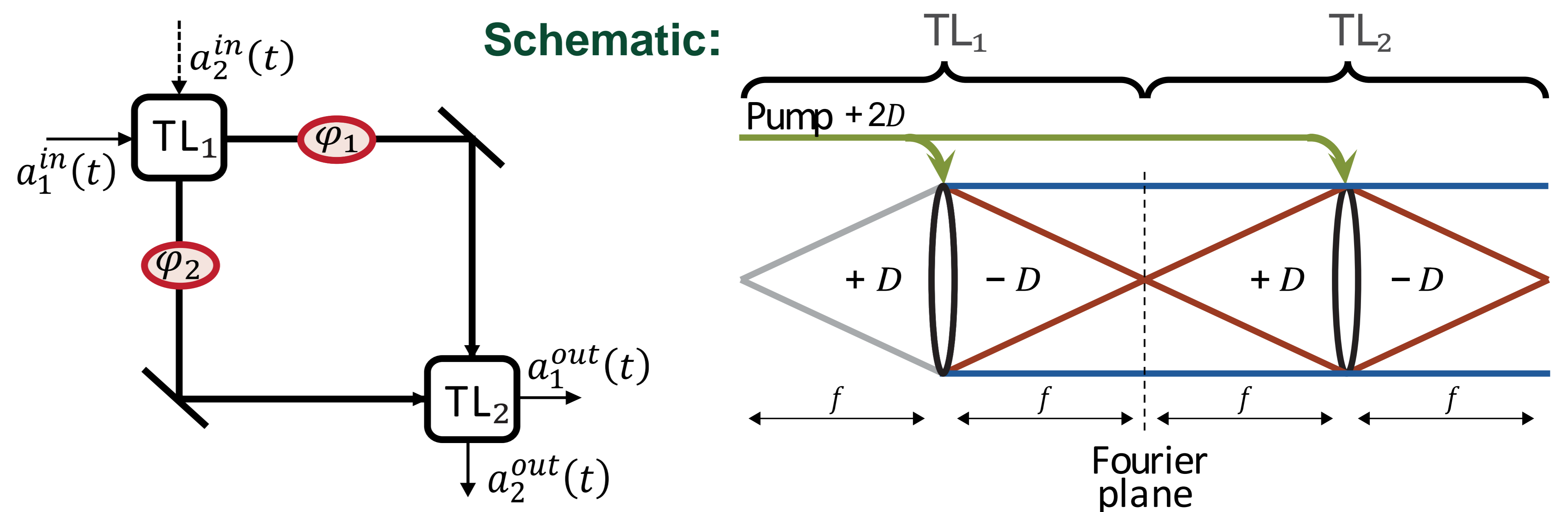
Ultrafast temporal SU(1,1) interferometer

Sara Meir, Hamootal Duadi, Eliahu Cohen and Moti Fridman

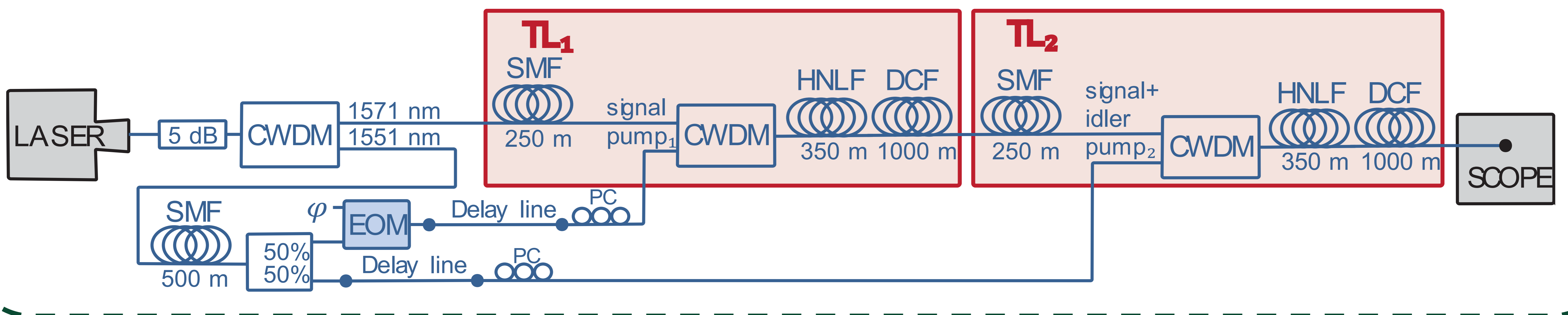
Interferometers are highly sensitive to phase differences and are utilized in numerous schemes where quantum SU(1,1) interferometers are able to improve the sensitivity of classical interferometers. We theoretically develop and experimentally demonstrate, a temporal SU(1,1) interferometer based on two time-lenses in a 4f configuration. This temporal SU(1,1) interferometer generates an interference pattern between different times and frequencies of the input signal. Therefore, this interferometer is highly sensitive to ultrafast phase shifts with lower noise levels than classical interferometers. This interferometer can be utilized for temporal mode encoding and studying the temporal structure of entangled photons.

Benefits of ultrafast temporal SU(1,1) interferometers:

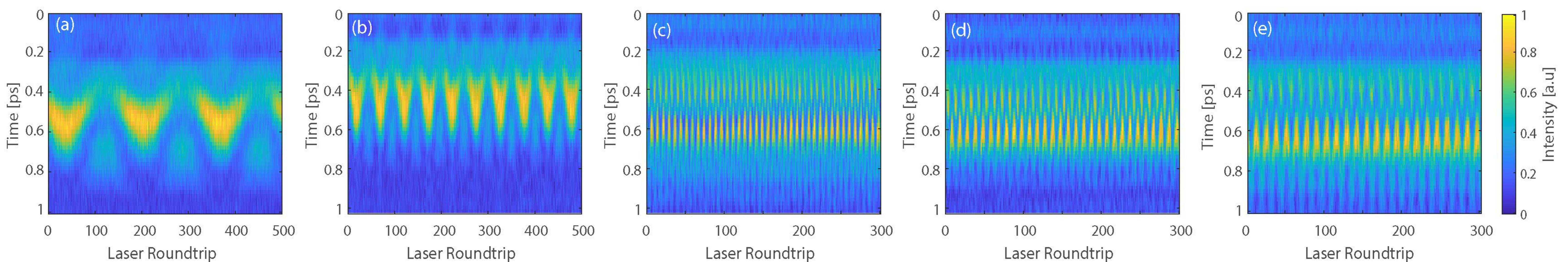
- Ultrafast temporal resolution.
- Interference in both temporal and spectral domains.
- Sensitivity to the phase derivative.



Experimental setup:



Results:



(up) Measured intensity of the output idler wave as a function of round-trips, showing the temporal oscillations where the EOM frequency is: (a) 4 GHz – (e) 12 GHz. The color map denotes the intensity.

(right) Intensity correlation and Spectral correlation as a function of the frequency of the EOM, showing the limit between regular SU(1,1) interferometer and temporal SU(1,1) interferometer. We measured positive intensity correlation for low frequencies while higher frequencies show negative intensity correlation and negative spectral correlation for low frequencies while higher frequencies show positive spectral correlation.

