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Nanoscale structural dynamics by EUV transient gratings

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Collective dynamics at the nanoscale in condensed matter is important for advancing both fundamental science and modern technology. The study of heat transport processes, vibrational modes or magnetization dynamics in the sub-100 nm length-scales can greatly benefit from the development of experimental tools for probing such dynamics and on the relevant timescale (i.e. ps and sub-ps) without relying on ad hoc sample's nanostructuration.
In this contribution we present a "contact-less"approach, where the sensitivity to the sub-100 nm length-scale is granted by the use of extreme ultraviolet transient gratings (EUV TG) [1]. We will discuss the application of this new experimental tool (available at the FERMI free electron laser facility in Triste; Italy) for the study of non-diffusive nanoscale thermal transport in thin membranes of crystalline silicon and amorphous silicon nitride [1,2]. We will also show the possibility to use EUV TG for generating and detecting the dynamics of bulk and surface phonons on a previously inaccessible wavelength range [3], as well as nanoscale magnetization gratings [4] and coherent magnons [5].

References
[1] F. Bencivenga et al., "Nanoscale transient gratings excited and probed by extreme ultraviolet femtosecond pulses", Science Advances 5, eaaw5805 (2019).
[2] A.A. Maznev et al., unpublished
[3] L. Foglia, R. Mincigrucci et al., "Extreme ultraviolet transient gratings: A tool for nanoscale photoacoustics", Photoacoustics 29, 100453 (2023)
[4] D. Ksenzov et al., "Nanoscale Transient Magnetization Gratings Created and Probed by Femtosecond Extreme Ultraviolet Pulses", Nano Letters 21, 2905-2911 (2021)
[5] P.R. Miedaner et al., "Excitation and probing of short-wavelength coherent spin waves by femtosecond extreme ultraviolet pulses", Science Advances 10, eadp6015 (2024)

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