Magnetization dynamics after non-collinear dual optical excitation

[in-depth report]

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In the world of optically isotropic materials, a long-standing assumption posits that dual-angle sample illumination offers no more than single-directional intensity. Our pioneering research challenges this orthodoxy, revealing a tantalizing revelation. Venturing into the captivating realm of magnetization dynamics, ignited by non-collinear ultrashort laser pulses, we've unearthed a profound truth: these pulses trigger a dramatic metamorphosis in magnetization dynamics [1]. Within the graceful ballet of permalloy's magnetization precession, an astonishing discovery takes center stage – the resonance of Gilbert damping crescendos when these pulses align in polarization. Remarkably, the ensuing changes in electronic properties endure well beyond the fleeting laser pulses.

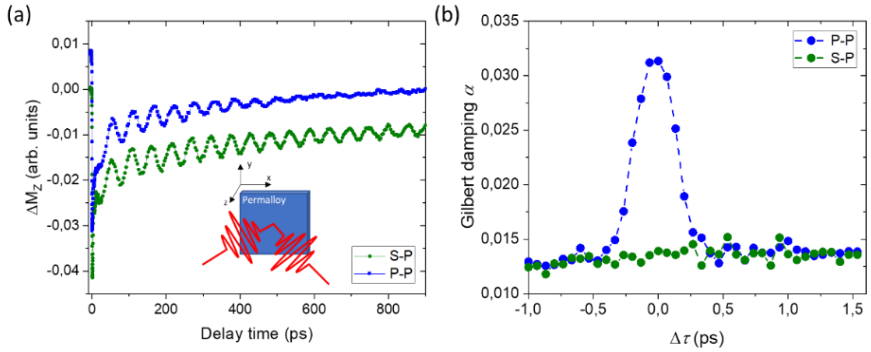

Figure 1. (a) Time-resolved magnetization dynamics reflecting the optical excitation of spin precession in permalloy excited with two 300 fs pulses having two different combinations of linear polarization. (b) Gilbert dumping as a function of delay between two pumps Δτ. The combination of pump polarization is the same as in panel (a).

This captivating phenomenon isn't confined to one material; it spans diverse aspects of magnetization dynamics, challenging our understanding of light-magnetic media interaction. The underlying physics remains a mystery while indicating that the key requirements is the interference between the two pulses yet excluding the effect of transient grating formation. Armed with a trove of experimental revelations, we seek to ignite discussion and collective wisdom sharing. Our round table format promises to sow the seeds of future research, unveiling the enigma of non-collinear dual optical excitation.

[1] S. Parchenko, et al, *Gilbert damping control with non-collinear dual optical excitation*, arXiv preprint at https://doi.org/10.48550/arXiv.2305.00259.