

Air Nonlinearity triggered by an ultra-intense sub-5 THz light bullet

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Air turns into a nonlinear medium for electromagnetic waves under exceptionally strong fields [1]. However up to present, its minuscule nonlinear response has limited the exploration to the optical frequency regime owing to the availability of intense near-infrared lasers. Here, we report on the observation of large-amplitude nonlinearity in air induced by an extremely intense light bullet [2] at THz frequencies provoking strong air birefringence [3]. The observed nonlinearity manifests itself as third order susceptibility. The presented nonlinear observations break the barrier for the entire exciting THz-induced nonlinear phenomena in air ranging from THz-induced self-focusing and self-phase modulation to THz solitons and filamentation. Our pulse was 3.9 THz-centered and its peak field and intensity were 3.3 GV/m and 14.4 PW/m², respectively.

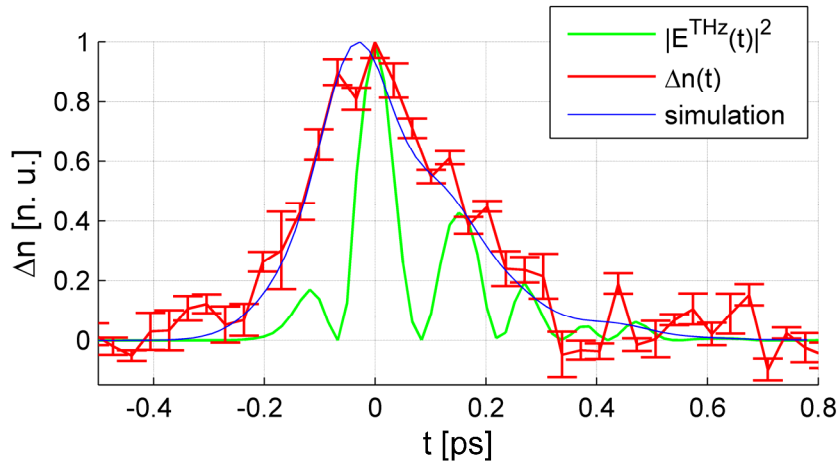


Fig. 1 A comparison between the THz intensity, the measured birefringence and simulations.

References

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- [3] M. Shalaby and Christoph P. Hauri, arXiv:1410.0219 (2014).