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Frequency domain tomography of evolving laser-plasma accelerator structures PENG DONG, STEPHEN REED, SERGUEI KALMYKOV, GENNADY SHVETS, MIKE DOWNER, Department of Physics, University of Texas at Austin — We recently reported detailed snapshots of quasi-static laser wakefield accelerating structures captured by Frequency Domain Holography (FDH) [1]. Here we demonstrate a generalization of FDH capable of recovering evolving laser-plasma structures. In its simplest form, analogous to a streak camera, we supplement the conventional collinear FDH probe-reference pulse pair with a second pair that propagates at angle A with respect to the pump. Simulations show that an evolving plasma bubble behind the drive pulse leaves an imprinted phase steak on the probe tilted at angle $A/2$ with respect to the probe phase front. Its recovered phase tracks bubble evolution. We will present preliminary experimental results using a 200TW pump. A comprehensive generalization, analogous to computer-aided tomography, uses probe-reference pairs propagating through the plasma at multiple angles. We will present simulations showing how complexity of the structure and its evolution determines the number of probe angles needed for accurate reconstruction. [1]N. H. Matlis et al., Nat. Phys. 2, 749(2006)

Prefer Oral Session
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