Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Real-time 3D holographic imaging using phase coherent photorefractive quantum wells AMIT DONGOL, AMIN KABIR, XIAOSHENG WANG, HANS PETER WAGNER, Department of Physics, University of Cincinnati, Cincinnati, OH-45221, USA — Photorefractive semiconductor quantum wells (QWs) are ideal dynamic holographic films for optical coherence imaging (OCI) because of their high diffraction efficiency and fast response time. Recently, we discovered a phase coherent photorefractive (PCP) effect in ZnSe QWs which utilizes the coherence of excitons for time gating. This new quality enables "single-shot" three-dimensional (3D) OCI in which the depth of an object is determined from the brightness profile of its holographic image. The short refresh time ($\sim$10 microseconds) of the PCP effect therefore allows real-time video acquisition of moving objects with a depth resolution of a few micrometers. We present real-time and depth-resolved OCI of moving glass beads of $\sim$100 micrometer size in solution using 90 fs laser pulses. Our measurements demonstrate the potential of the PCP effect for studying 3D diffusion and aggregation of micro objects that are dispersed in soft materials.

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Date submitted: 11 Dec 2009 Electronic form version 1.4