Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Femtosecond laser fabrication of micro/nano-channel array devices for parallelized fluorescence detection BRIAN CANFIELD, WILLIAM HOFMEISTER, LLOYD DAVIS, University of Tennessee Space Institute — Cost-effective pharmaceutical drug discovery depends on increasing assay throughput while reducing reagent needs. Ultrasensitive, highly parallelized fluorescence-based platforms that incorporate a nano/micro-fluidic chip with an array of closely spaced channels would meet this need. We discuss the use of direct femtosecond laser machining to fabricate prototype fluidic chips with arrays of more than one hundred closely spaced channels. Traditional machining techniques involve overlapping focal spots from many laser pulses while scanning the substrate in order to create channels. However, this procedure is not only lengthy but may allow thermal effects to accumulate that degrade the quality of both the channel profile and surrounding substrate material. We are developing a different method for machining a line with just a single pulse, using a combination of cylindrical lenses and an aspheric lens to reshape a near-Gaussian beam into a tight line focus. Channels on the order of 1 micron wide, 5 microns deep, and nearly 2000 microns long may be made this way. We also address the critical issue of mitigating the high autofluorescence responses that arise from the creation of defects by fs-laser machining in fused silica.

Brian Canfield
University of Tennessee Space Institute

Date submitted: 09 Nov 2012 Electronic form version 1.4