Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Strong-Field Emission From High Aspect Ratio Si Emitter Arrays[1] PHILLIP KEATHLEY, MICHAEL SWANWICK, ALEXANDER SELL, WILLIAM PUTNAM, STEPHEN GUERRERA, LUIS VELÁSQUEZ-GARCÍA, FRANZ KÄRTNER[2], Massachusetts Institute of Technology — We discuss photoelectron emission from an arrays of high aspect ratio, sharp Si emitters both experimentally and theoretically. The structures are prepared from highly doped single-crystal silicon having a pencil-like shape with end radii of curvature of around 10 nm. The tips were illuminated at a grazing incidence of roughly 84deg.with a laser pulse having a center wavelength of 800 nm, and a pulse duration of 35 fs from a regenerative amplifier system. Native oxide coated Si tips were characterized using a time of flight (TOF) electron energy spectrometer. An annealing process was observed, resulting in a red shift of the energy spectra along with an increased electron yield. Total current yield from samples having the oxide stripped were also studied. Apeak total emission of 0.68 pC/bunch, corresponding to around 1.5x10^3 electrons/tip/pulse was observed at a DC bias of 70 V . Both spectral and current characterization results are consistent with a stong-field photoemission process at the surface of the tip apex.

[1]This work was funded by Defense Advanced Research Projects Agency (DARPA)/Microsystems Technology Office and the Space and Naval Warfare Systems Center (SPAWAR) under contract N66001-11-1-4192.
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Date submitted: 03 Jan 2013 Electronic form version 1.4