

**MEASUREMENTS OF THE CORRELATION
BETWEEN PLASMA BUBBLE DYNAMICS
AND ELECTRON TRAPPING IN A LASER
WAKEFIELD ACCELERATOR***

Dmitri Kaganovich[†], Michael Helle^{††}, Daniel Gordon, and
Antonio Ting
*U.S. Naval Research Laboratory, Plasma Physics Division,
Washington, DC 20375*

Generation of conically emitted second harmonic radiation has recently been observed in a laser wakefield accelerator experiment at the U.S. Naval Research Laboratory. This second harmonic is the result of frequency mixing within the sheath surrounding a fully cavitating plasma region, “plasma bubble,” created by the ponderomotive force of a laser[1]. Using this second harmonic signature, we have indirectly studied the dynamics of a plasma bubble [2]. It has been observed that the plasma bubble dynamics are strongly correlated to the generation of electrons. Specifically, the onset of the bubble is connected to the generation of off-axis electrons[3], while forward accelerated electrons have been observed when the conical distribution of second harmonic is broken, signifying the disruption of the plasma bubble. Further results on bubble dynamics and its connection to electron beam production will be presented.

[1] D. F. Gordon et al., Phys. Rev. Lett. **101**, 45004 (2008).

[2] M. Helle et al., submitted to Phys. Rev. Lett.

[3] D. Kaganovich et al., Phys. Rev. Lett. **100**, 215002 (2008).

[†]Icarus Research Inc., Bethesda, MD 20824

^{††}Department of Physics, Georgetown University,
Washington, DC 20057

* This work is supported by the Office of Naval Research and the Department of Energy.