Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

An energy-spectrum shift in the interaction between a bubble swarm and oscillating-grid turbulence analyzed via recursive PIV TAKAYUKI SAITO, KOICHI MORIKAWA, TOSHIYUKI SANADA, Shizuoka University — In order to elucidate the liquid-phase turbulence modulation owing to dispersed bubbles, the authors employed both methods to generate arbitrary turbulence and control the bubble size and bubble number density of the bubble swarm. For the first purpose, a method of well-controlled oscillating-grid turbulence was employed; this method easily characterized integral scale and Taylor micro scale. For the second purpose, a bubble formation method using audio speakers was employed; this method completely controlled bubble size, bubble number density and launch timing. In the present study, the swarm of zigzagging rising bubbles in 2% void fraction was examined. Liquid phase velocities at two spatially-separate points were measured via two LDV probes, simultaneously. Furthermore, liquid-phase velocity field was measured via recursive PIV with a high-speed video camera. Motion of each bubble was obtained from visualization and 4-time-step tracking algorithm. From the two-point LDV data, turbulence intensity, spatial correlation, integral scale and Taylor micro scale were calculated and discussed. From the PIV results, energy spectra were obtained. On the basis of these results, interactions between the turbulence induced by the bubble swarm (i.e. dispersed bubbles) and ambient liquid-phase turbulence are quantitatively and systematically discussed.

Toshiyuki Sanada
Shizuoka University

Date submitted: 26 Jul 2007 Electronic form version 1.4