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Multibubble Dynamics: Phase Shift, Transition Frequency, and Avoided Crossing MASATO IDA, CCSE, Japan Atomic Energy Research Institute — The oscillation phases and resonance frequencies of multibubble systems in a sound field are considered to show hidden complexities of bubbles. In recent papers [e.g. Ida, Phys. Lett. A 297, 210 (2002)] we have shown that bubbles in a multibubble system can reverse their own oscillation phase not only at their resonance frequencies but also around some other driving frequencies. In those studies we introduced the notion of a transition frequency which is the driving frequency at which the phase reversal of a bubble occurs. This notion has already been utilized to understand the sign reversal of the secondary Bjerknes force [e.g. Ida, Phys. Rev. E 67, 056617 (2003)], showing that the sign reversal takes place at the transition frequencies that do not correspond to the resonance frequencies. In the present study [Phys. Rev. E, accepted], we show that in certain cases the phenomenon of avoided crossing appears in the resonance frequencies of a multibubble system as the separation distances between the bubbles are varied, and a kind of state exchange takes place among the bubbles at a point, detectable by observing the transition frequencies, in the avoided crossing region.

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