Measurement of Unsteady Flow Field and Estimation of Sound Source in Wind Tunnel Tests

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We constructed a system for the simultaneous measurement of flow field and sound pressure by time-resolved PIV (Particle Image Velocimetry) and a microphone respectively in a small-scale wind tunnel; further, we investigated the cross-correlation by applying the result of flow field to "Howe's vortex theory". The analysis of single cross-section PIV measurement for a cylindrical specimen has shown a strong cross-correlation between the sound pressure predicted by PIV and the actual sound pressure. Then, we developed a measurement system for dual-plane PIV using a polarizing technique in order to measure flow fields of two cross-sections simultaneously and consider the three dimensional distribution of sound sources. The linearity of the coherence and phase difference between two cross-sections with respect to the separation distance has been clarified.