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Conduit Bound Sound Propagation Separation Model KEN MCGILL, ARTHUR SHUE, ABIGAIL SAVAGE, AIDAN BURLESON, CAIN GANTT, JOSHUA MOORE, Georgia College — In a fluid flowing in a conduit if a sound source is placed up-flow and a sound wave is sent propagating through the conduit in the same direction as the fluid flow the sound propagates at the speed-of-sound plus the velocity of the fluid. When a sound source is placed down-flow the sound propagates at the speed-of-sound minus the flow velocity of the fluid. Once the up-flow and down-flow propagation speeds are determined it is a trivial to determine the velocity flow and speed-of-sound of the fluid. It has been shown that one measurement of phase cannot remove the interference of other reflected waves, and leads to an erroneous calculations of flow velocity and speed of sound. This presentation describes a method employing an array of transducers to measure the propagating sound at multiple locations. The phase of the propagating wave form can be determined by employing a fast 2D FFT of time domain signals acquired at several locations in the directions of the fluid flow. This leads to a far more robust and accurate determination of the up-flow and down-flow propagation speeds, which leads to a more accurate calculation of the velocity flow and speed-of-sound of the fluid.

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