DIFFERENTIAL-PHASE OPTICAL DOPPLER TOMOGRAPHY FOR FLUID FLOW VELOCITY MEASUREMENT

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ABSTRACT

We have developed a novel differential-phase optical Doppler tomography (DP-ODT) system that is able to measure the fluid flow velocity tomographically with high velocity resolution and sensitivity. By using a low-coherence light source and integrating with analog differential-phase detection technique, DP-ODT can achieve better performance in flow velocity measurement than numerical decoding methods based on Hilbert transformation.

METHOD

The proposed DP-ODT system employs a SLD (830 nm) as the light source and uses analog differential-phase decoding method in flow velocity determination. PZT is used to modulate the Doppler frequency shift of the reference light beam for optical heterodyne detection. The polarization-division interferometer setup used in DP-ODT is able to acquire the orthogonal heterodyne signals and the differential-phase signal which can be used to recover the velocity of the fluid flow precisely.

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