

Transmission multi-view ultrasonic tomography of air temperature inhomogeneities

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A method of ultrasonic transmission tomography of air is proposed for obtaining images of temperature inhomogeneities. The system of transmitters and receivers is placed on a circle, which allows probing for the passage and for reflection of the inhomogeneity of the medium located inside the circle. Sounding is carried out using broadband signals with linear frequency modulation. It is proposed to restore the image of air temperature inhomogeneities by the method of spatially consistent filtering in the single scattering approximation. Reconstruction of the temperature distribution is based on the calculation of the spatial distribution of the speed of sound from the phase delays of the passing ultrasonic field. An experimental setup for ultrasonic air tomography has been developed, operating in the frequency range from 38 to 43 kHz. Experimental studies have shown the possibility of restoring the air temperature distribution.

Keywords: Transmission tomography, temperature distribution, matched filtering, MIMO.

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