UDC 621.375

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THE TWO-WAVE LDV WITH COPHASED RECEPTION OF THE DOPPLER SIGNALS

Established common development property phase and polarization scattering effects, as well as the conditions of coherent two-beam moving particles sensing, in which the formation of the observed phase conjugate, opposite-and quadrature signals [1,2] allow ODR to develop schemes with optimal reception of the scattered radiation.

Researches of the differential scheme of sensing of optical Doppler radar (ODR) with the reception of backscattered light that shows [1] that the signal / noise ratio at the output of photodetectors essentially depends on the degree of polarization-phase-matching mixed on a photodetector wave.

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In the widely used classical scheme of ODL [1] with two coherent beams sensing at the same wavelength [1] and reception of the scattered radiation in a relatively large aperture angle formed by optical mixing a useful signal at the Doppler frequency (determined by the projection of the velocity vector to the difference wave vector two probing beams) depends strongly on the phase matching of elementary Doppler signals for each direction of the reception of the scattered radiation, leading to a sharp decrease of the signal / noise ratio and thus the accuracy of the measurement. By reducing the angular aperture of the receiving power drop occurs as useful Doppler signal which can be compensated by increasing the power to the single-wave laser, which leads to undesirable and thus non-linear increase of weights and dimensions LDV.

An alternative solution to this problem for the ODR can be the use of two or more (in the limiting case of a matrix of n-lasers), semiconductor, compact lasers that emit at different wavelengths of single-mode radiation from a plane wavefront, or dual-wavelength or multi-wavelength mode of the laser.

The physical foundations of constructing multi-wavelength ODR [3] using the two-wave LDV.

The ODR of a new generation is designed on the basis of author's technology of the formation of a phase-conjugate signals [1,2] providing common-mode reception elementary Doppler signals, which in contrast to the classical scheme of the ODR, the frequency of the Doppler signal is independent to the wavelength of the received in different directions of the scattered radiation.

Analyzed the way of developing of the two-wave ODR (TWODR) with the reception of the forward-scattered light, which uses a double-wavelength laser

emitting at two wavelengths λ1 and λ2. This TWODR formed one pair of parallel beams at a wavelength λ1, for example, horizontal polarization, and a second pair of axially symmetric beam at another wavelength λ2, with vertical polarization (polarization azimuths are respectively αλ2 = 90 °; αλ2 = 0 °) - Furthermore, in the TWODR when receiving scattered radiation used polarization filtering of optical signals in conjunction with spatial filtering of the phase signal, as carried out at the wavelength λ1 and the - λ2. Synthesis of phase of spatial filters (PSF) on the computer for two-wave mixing prism with phase matched filtering (set in the receiving channel with the acquisition of forward-scattered radiation), manufactured on the basis of nanotechnology, considered by the authors [4] and is based on developed by us theory and created application of the synthesis of PSFon computers.

We also consider the option of constructing of two-wave TWODR with the reception of the backscattered radiation, which in contrast to the TWODR scheme used sensing beams at wavelengths λ1 and λ2, matched polarization, and a polarization which provides a form of phase-conjugate symmetric signals at the reception as the wavelength of the radiation λ1 and λ2 [1,2].

Use of phase coherent spatial filtering of signals simultaneously at different wavelengths and the conditions achieves optimum reception of the signal / noise ratio at the output of the ODR times and more compared to the known schemes of LDVs. This can significantly improve the accuracy of measuring the speed by using new generation of TWODR [6,7].

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