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A new optical technique for the generation of LDA-quadrature signals

Noboru Kurihara,

Fluid Measurement Section, Mechanical Metrology Department, Mechanical Research Laboratory of Metrology, Umezono, Tsukuba 305, Japan

Harald Müller, Rainer Kramer, Gesine Grosche, Dietrich Dopheide

Department for Fluid Dynamics, Physikalisch-Technische Bundesanstalt PTB,

Bundesallee 100, 38116 Braunschweig, Germany

ABSTRACT

A novel LDA technique which uses two single frequency lasers, one for each LDA beam is presented. In contrast to previously presented techniques using the optical frequency difference of the lasers for directional discrimination, the technique described here generates a quadrature signal pair by an *optical* superposition technique without any broad band electronical heterodyning.

In order to extract the Doppler frequency optically, undesired mixing products have to be avoided. The realisation of this concept is based on the superposition of four light waves on one photodetector, where only two pairs of light waves are able to interfere forced by polarisation or by optical adjustment. Thus the photodector acts as an optoelectronical element to superimpose two optical beat signals, so that the envelope of the resulting output signal directly delivers the Doppler frequency (see figure 1(a)).

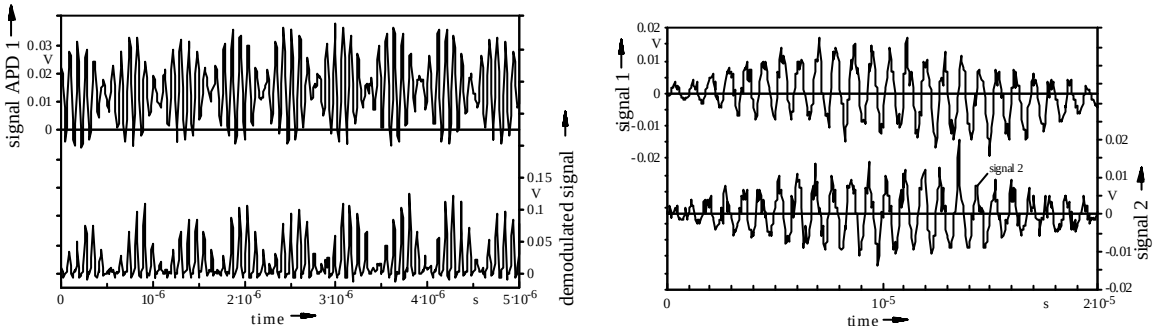

Fig. 1: (a) photodetector output signal (i) and demodulated signal (ii), filtering of (ii) delivers the burst signal periods in fig. 1(b) (b) quadrature LDA-burst signals after filtering of the demodulated quadrature burst signals

In order to get the desired directional information by generating quadrature signals (see figure 1(b)), a second photodetector is required. The quadrature signal generation can easily be realised either by an optical path length difference between the light waves or by positioning the photodetectors against each other in the expanded wavefront of the reference beams. Different concepts of a directional LDA based on the application of two lasers and the described optical superposition technique have been realised.