

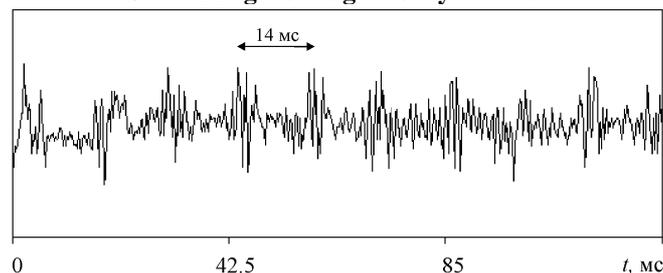
Self-mixing laser interferometry in medical diagnostics

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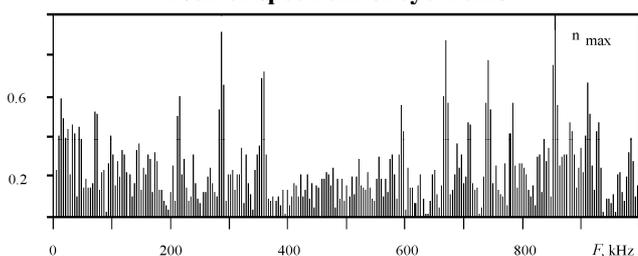
I. SELF-MIXING INTERFEROMETRY OF OCULAR TREMOR

It is known that the eye is characterized by tremor and saccadic movements. The most difficult is the diagnosis of microsaccadic eye movements, known as ocular tremor, whose amplitude does not exceed a few microns. We recorded periodic eye movements with a frequency of 72 Hz. The amplitude of the eyeball tremor was calculated from the harmonic with the maximum amplitude of the self-mixing signal spectrum. The average amplitude of the ocular tremor of a healthy patient was 1.4 microns.

Self-mixing laser signal of eye tremor



Fourier spectrum of eye tremor



II. SELF-MIXING INTERFEROMETRY OF IOP

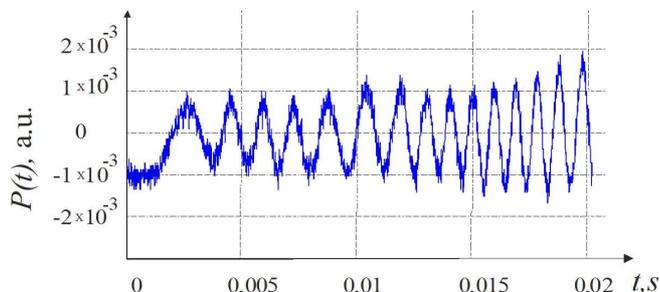
The possibility of using a self-mixing laser for measuring intraocular pressure (IOP) has shown. Deflection and acceleration of the scleral membrane of the eye under the influence of a pneumatic pulse were measured. Using the ratio of these parameters, the value of intraocular pressure was determined. IOP measurements were performed in vivo.

Measuring device



It was found that the deflection and acceleration of the scleral shell from pneumatic pulses, measured an hour after instillation of the drug, increased for deflection by 33.5 %, for acceleration by 25.9 %. The deflection to accel. ratio increased by 6.0 %.

Self-mixing laser signal of eye after air pulse impact



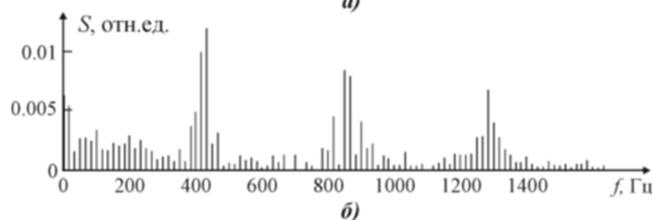
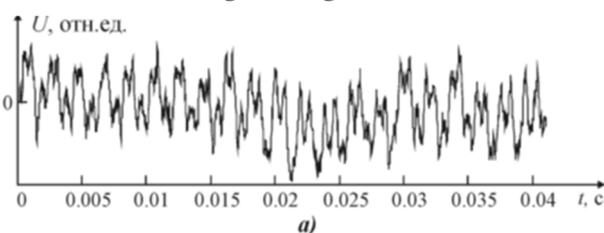
III. SELF-MIXING INTERFEROMETRY OF EARDRUM

It is important to know the state of the structures of the middle ear during surgical interventions, combined with the installation of implantable hearing aids in the tympanic cavity. The amplitude-frequency characteristics of the tympanic membrane were measured at a sound pressure level on the tympanic membrane exceeding the audibility threshold by 50 dB at a sound exposure frequency of 420 Hz.

Measuring device



Self-mixing laser signal of eardrum



Spectrum of self-mixing signal

As can be seen from fig., in the spectrum of the self-mixing signal, the maximum amplitude has a harmonic corresponding to the tripled oscillation frequency of the emitter of sound waves.