Dynamic Method for Measurement of Piezo-Optic Coefficients

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The influence of mechanical fields on the propagation of light through a crystal is described by the piezo-optical effect (inducing quantity (i.q.): mechanical stress) or the elasto-optical effect (i.q.: mechanical strain). Dynamic strain fields are usually realised by ultrasonic waves ("acousto-optics") and the theory of the interaction of light and ultrasonic waves with anisotropic materials (e.g. Raman-Nath theory [1]) yields a number of experimental approaches to the elasto-optical constants, e.g. Acousto-optic diffraction or Brillouin scattering. The realisation of homogenous low frequency dynamic stress in crystals rises experimental difficulties. In terms of quality of data to our best knowledge the static method of Pockels [1] could not be surpassed by any dynamic method given in literature. In this work we present a dynamic device for the generation of a homogeneous low frequency (1 – 10 Hz) mechanical stress field, based on a piezo-ceramic translator that generates a periodic uniaxial pressure. The crystal sample (parallelepiped with parallelity of faces of ±1 µm) is arranged in a sandwich-like system "translator-quartz-crystal-quartz", where the quartz slabs act as force sensors that control the stress homogeneity. For the measurement of the piezo-optic coefficients via optical retardation this device is either integrated into a Jamin interferometer or into the arrangement of rotating analyser [2].

[1] Narasimharmurty T.S., *Photoelastic and electro-optic properties of crystals*, Plenum Press, New York 1981. [2] Wood I.G., Glazer A.M., *J. Appl. Cryst.,* 1980, **13**, 217.

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