2nd INTERNATIONAL CONFERENCE ON PHYSICS OF OPTICAL MATERIALS AND DEVICES

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BOOK OF ABSTRACTS

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APPLICATION OF FOURIER-PADE APPROXIMATION IN ANALYSIS OF MATERIALS FOR OPTICAL APPLICATIONS

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Fast Fourier transform (FFT) is the most popular tool in spectral analysis, primarily because of its computational efficiency and a steady convergence as a function of increasing the sequence length. In this paper a method based on Fourier transform and Pade approximants is investigated for analysis of materials used in holography. Pade approximants are numerical tool that can be used to accelerate the convergence of a slowly converging sequence. Namely, for a power series

$$F_n(z) = \sum_{n=0}^{N} c_k z^k \qquad (1)$$

of order N in the variable z (real or complex) with coefficients c_k, Pade approximant is a rational fraction $P_m(z)/Q_n(z)$, which approximates the fully converged values of the function $F_n(z)$. If we let $z=e^{-jkn}$, then equation (1) corresponds to DFT, so Pade method is used to improve spectral resolution of FFT. This method is usually called Fourier-Pade (FP) approximation.

We applied Fourier-Pade approximation on data acquired by AFM scans of diffraction grating investigated in [1,2], proving advantages of using FP for spectral analysis instead of FFT.

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MEASUREMENT OF LASER-INDUCED FLUORESCENCE OF OPTICAL MATERIALS USING A TIME-RESOLVED SPECTROMETAR

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Depending on the specific application, fluorescence measuring systems strongly differ in instrumental design, i.e. use of optical components, detection systems as well as in measurement geometries including the sample cell. Therefore, it is necessary to calibrate almost every system individually in order to ensure accurate signal interpretation.
We report here various approaches for the calibration of the time-resolved laser-induced fluorescence (TR-LIF) detection system. This system is based on the tunable Nd:YAG laser (320-475 nm) to excite samples and on the detection part with high spatial and temporal resolution [1]. In this paper we shall describe different methods for calibration [2-4] and the possibility of their application to our TR-LIF system, having in mind the most important experimental parameters of calibration procedures. Feasibility of some methods will be tested with standard fluorescent dyes, such as fluorescein which is intended for use in establishing a reference scale for fluorescence intensity [5]. The data will be compared with values reported in literature for these dyes. The sources of errors due to an inadequate calibration system will be also discused.

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