Complex interferometry application to determine spontaneous magnetic field in laser produced plasma

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Among many different methods of measuring magnetic fields in plasma only one based on the Faraday effect creates a real possibility of obtaining distributions of these fields in the entire area of the investigated plasma. In this approach magnetic field distribution is obtained from simultaneous measurements of distribution of polarization plane rotation angle of the probing wave and electron density distribution of plasma. This method has been successfully applied during experiment at PALS (Prague Asterix Laser System) \cite{1}.

However, more credible approach to determine magnetic field distribution is complex interferometry which allows to obtain information about the magnetic field directly from phase-amplitude analysis of a complex interferogram.

The paper presents the methodology for quantitative analysis of the complex interferograms acquired with 2-channel polaro-interferometer operated in the complex interferometry option during the experiment at PALS \cite{1}. The subsequent stages of quantitative complex interferogram analysis are shown, including the determination of the rotation angle and the electron density distributions in order to compute the spontaneous magnetic fields distribution.

The space-time magnetic field distributions obtained by means of the phase-amplitude analysis of the complex interferogram have been compared with the results from the classical polaro-interferometry \cite{1}.