

DETERMINATION AND MODELING OF SPATIAL-FREQUENCY DEPENDENT GOUY PHASE IN TERAHERTZ TIME-DOMAIN SPECTROSCOPY

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The transmission measurements in THz spectral range using time-domain spectroscopy are often affected by the amplitude and phase changes due to spatial properties of the Gaussian beam close to the focus. This axial anomaly is called the complex Gouy phase and is able to influence measurements as well as determination of material parameters of a measured sample. Method of the Gouy phase shift compensation has been published in our previous papers [1] and [2].

In this paper, we suggest procedure to determine experimentally spatial-frequency dependence of the complex phase with additional effects of non-axial components because of focusing on a finite size detector. Mathematical model is compared with the experimental data set. The analysis provides a quantification of the possible Gouy shift errors in data.

[1] P. Kolejak, K. Postava, M. Micica, P. Kuzel, F. Kadlec, J. Pistora, *Experimental Gouy phase shift compensation in Terahertz time-domain spectroscopy*, J. Phot. Nanostr., (to be published, 2018).

[2] P. Kuzel, H. Nemec, F. Kadlec, C. Kadlec, *Gouy shift correction for highly accurate refractive index retrieval in time-domain terahertz spectroscopy*, Opt. Express 18 (2010) 15338–15348.