Verification of interferometric measurements by computer modelling

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Verification of measurement errors has a big impact on assessment of accuracy of conducted measurements and obtained results. In many cases computer simulation results are compared with measurement results in order to evaluate measurement errors.

The purpose of our research was to check the accuracy of measurements made with Fabry-Perot interferometer working in the transmission mode. In measurement setup, a 1310 nm superluminescent diode light source, single-mode optical fibres and optical spectrum analyser were used. Influence of length of resonating cavity and refractive index on the envelope of interferogram was investigated.

We created a program that models envelope of the interferogram on the basis of: length of the resonating cavity, refractive index and light source output spectral characteristic, which in simulation, was assumed to have shape of Gaussian distribution. After the simulation the program compares simulated and measured interferograms.

The comparison of simulated and measured interferograms proved to be challenging due to the shift in the position of the central peak between the simulated and measured interferogram. There are two ways to perform model fitting: by adjusting the position of central peaks or minimums next to the central peak. It was observed, that the second solution was more optimal and was implemented in the program.