



## Assistant for Validation of the Optical Sample Model

In the recent years, hardware for ellipsometry has been developed to a high level which allows detecting sub-nanometer changes in the thickness of a film. This leads usually to the assumption that the results can be trusted as displayed.

However, the ellipsometry method is still measuring thicknesses and refractive indices indirectly by adjusting an optical model of the layer stack in a way that the theoretically calculated spectra match the measured ones.

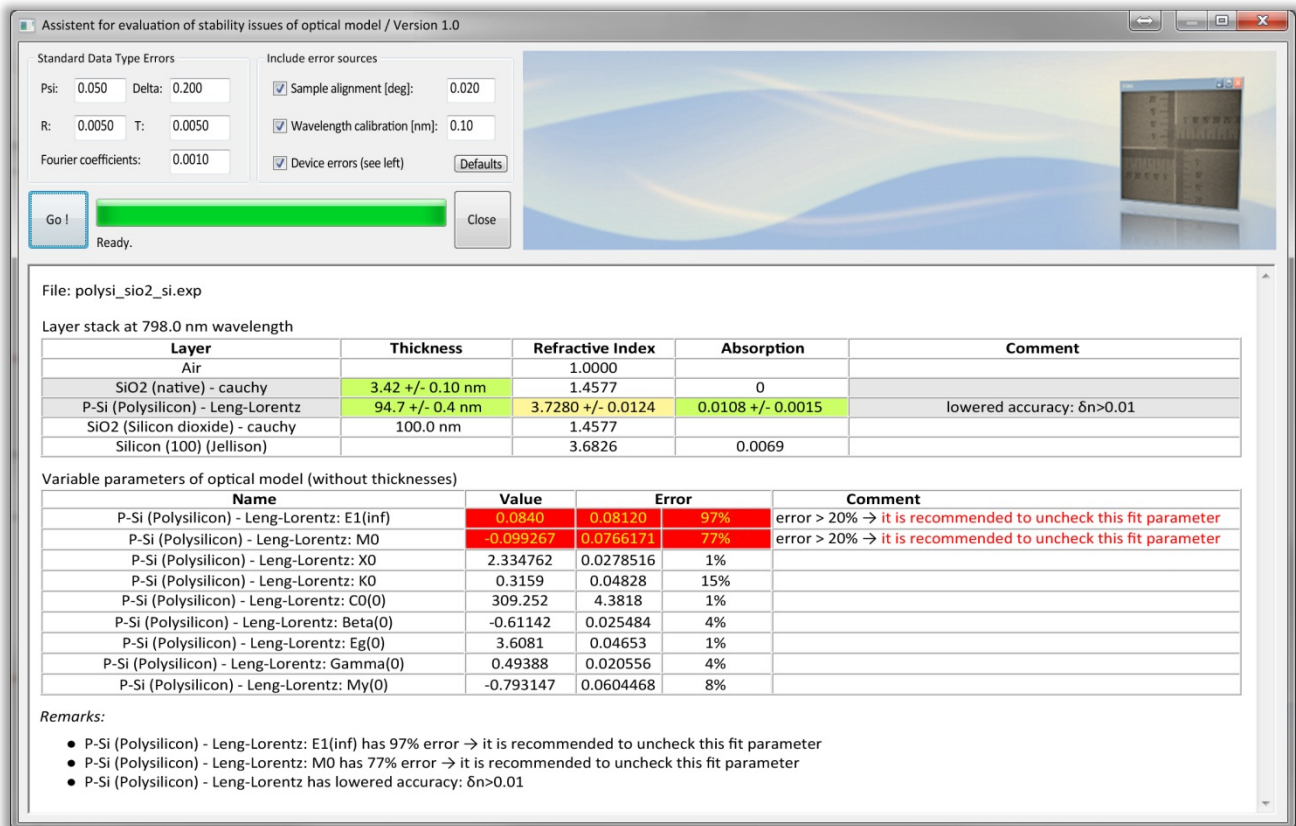
**Problems:** For users it is a common difficulty to decide whether the optical model is only a rough description of the sample or if it is safe to refine the model by adding more details like interfaces or material properties.

Another question is whether the error propagation has substantial effect on the accuracy of thickness and refractive index values.

Usually, a correlation matrix is calculated which lists the errors of all fitting parameters and allows detecting cross coupling effects. However, the output of such analysis is difficult to read and no indication is given how to improve the optical model.

SENTECH has now developed an easy-to-use **assistant tool** for its spectroscopic ellipsometer software **SpectraRay/3** to solve these problems.

The new assistant for validating the optical model gives detailed instructions how the user can improve the optical model. The simplicity of the tool requires no additional input. The user easily runs the tool and reviews the instructions given in the report.



*Easy operation of the assistant for validation of the optical sample model*

The assistant works by assuming typical accuracies for matching theory and measurement as well as for sample alignment. It calculates the precision of the model including all parameters. In a second step, the error bars for the involved fitting parameters as well as the thicknesses and refractive indices are evaluated.

In the example report, the green color indicates that thicknesses and absorption index can be measured at expected accuracy. However, the model uses two parameters "E1" and "M0" which are cross-coupled and therefore increase calculation time unnecessarily (see red marks). To improve the model, the user simply has to follow the remarks next to them to get a stable model.

Another benefit of the assistant is that estimating the parameters' accuracy of the optical model is very simple.