# Asymptotic standard errors

## What are the "Asymptotic Standard Errors"?

The asymptotic standard errors (ASE) are used for analyzing fitting parameter error intervals. For illustration let's start at the best fit parameter set, which can be regarded as a single point in the parameter space. Now we remove the parameter for which we want to calculate the error intervals from this location, that is, we take a single step parallel to its parameter axis. We then calculate the reduced $X^2$ for this new paramter set. By iterating this procedure we get $X^2$ as a function of the parameter of interest. The intersection points of this function with a given $X^2$ confidence limit define the boundaries of the confidence interval of the parameter.

At PQ the asymptotic standard errors are supported by FluoFit and the SymPhoTime software.

## Advantages and disadvantages

The asymptotic standard errors are a direct outcome of the Marquardt-Levenberg algorithm. They are readily available without any further calculations. On the other hand they are valid if, and only if, the parameters are uncorrelated. A better way of calculating parameter errors are the support plane analysis or the bootstrap method.

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PicoQuant GmbH
Rudower Chaussee 29 (IGZ)
12489 Berlin
Germany

P +49-(0)30-1208820-89
F +49-(0)30-1208820-90
info@picoquant.com
www.picoquant.com