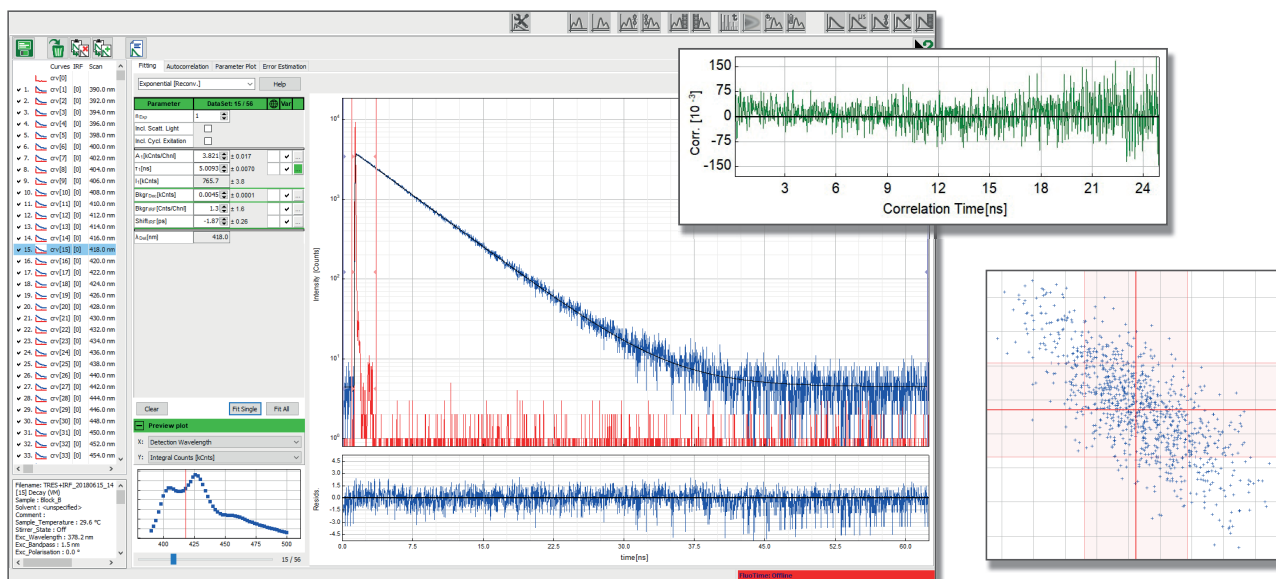# EasyTau 2

## Fluorescence Spectrometer Control and Data Analysis Software

- Data fitting / analysis software for set-ups based on PicoQuant TCSPC electronics
- Combined software solution for data fitting / analysis and controlling the FluoTime 300 spectrometer
- Wizard-guided measurements or full control with customized mode
- Steady-state and global decay analysis with robust error analysis
- Powerful scripting language for automation (local and remote)

The EasyTau 2 software package is the one-stop solution for both full hardware control of the FluoTime 300 spectrometer as well as for interactive data analysis and fitting. It can also be used as a data analysis software for custom set-ups based on PicoQuant TCSPC electronics. The integrated analysis and fitting module supports a broad range of fluorescence spectroscopy applications, such as steady-state excitation and emission spectra, fluorescence or phosphorescence lifetimes, or anisotropy measurements. EasyTau 2 combines and improved on the features of the previously separate FluoFit and EasyTau software in a single, easy-to-use package.

Full hardware control

The software package EasyTau 2 provides full control over all operational aspects of the FluoTime 300 fluorescence spectrometer in an intuitive and efficient way. A wide range of steady-state and time-resolved measurements can be carried out using a single graphical user interface. Supported methods include, amongst others, measurements of fluorescence or phosphorescence lifetimes, anisotropy, steady-state excitation and emission spectra, or Time-Resolved Emission Spectra (TRES). EasyTau 2 features specially designed applications wizards that guide a user through all optimization and measurements steps, enabling even novice users to perform such experiments. A customized measurement mode is provided for advanced users that desire full control over every instrumental parameter for every application.
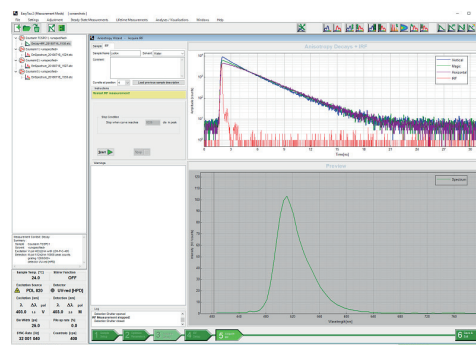

The power of scripting

Complex applications, such as e.g., alternating between measuring time-resolved decays and steady-state spectra at different temperatures, can be easily automated by using the included scripting language. EasyTau 2 also provides an interface for remote execution of scripts, so that the automation can be extended to third-party accessories such as robotic autosamplers.
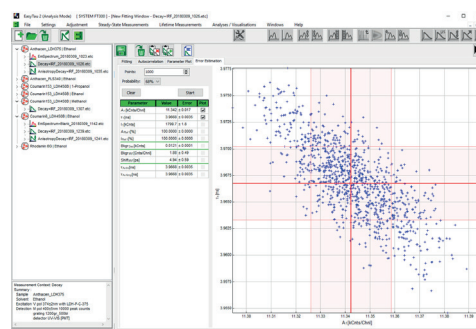
Data analysis at your fingertips

The fitting and analysis module of the EasyTau 2 combines powerful, yet easy-to-use algorithms with efficient data management. It is not only capable of handling results of the FluoTime 300 spectrometer, but can also import data from all PicoQuant TCSPC modules as well as ASCII files. The intuitive and interactive graphical user interface makes performing global decay as well as error analysis a breeze. All measured data is stored along with its related analysis results in a familiar file tree structure, that makes data dependencies visible at a glance. The module also comes with a powerful report generator to create presentation-ready plots or tables (as PDF or HTML files).
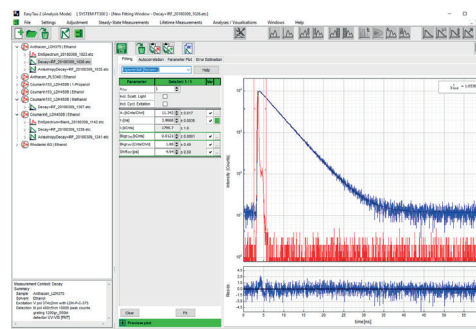
Fitting models and robust error analysis with a single GUI

EasyTau 2 supports both tail fitting and numerical reconvolution to account for the finite Instrument Response Function (IRF). Various models can be fitted to the decay data, including exponential decay (up to 5th order) or other distribution models, such as Gaussian, Lorentzian, or stretched exponential. All models support both global and batch mode fitting. The interactive graphical user interface simplifies setting starting parameters as well as fitting limits. Reduced chi-square, weighted residual and an autocorrelation trace are provided to assess the goodness of a fit. Additionally, a bootstrap error analysis can be carried out for every fit.

Specifications

FluoTime 300 hardware control	
Included wizards	Excitation and emission spectrum, time course excitation and emission spectrum, anisotropy excitation and emission spectrum, intensity time trace scan, temperature mapped emission spectra, excitation / emission mapping, quantum yield Phosphorescence decay, fluorescence decay, time-resolved anisotropy, time course decay, time resolved emission scan
Operation modes	Assisted mode using Wizards for standardized measurements Customized mode with full control of all hardware parameters Scripting mode for automation of routine measurements Remote execution of scripts (extension of automation to 3rd party devices)
Basic data handling	Arithmetic operations (addition, subtraction, multiplication, division), derivation, integration, normalization, smoothing, …

Fitting module	
Exponential decay models	up to 5th order
Lifetime distributions	Gaussian, Lorentzian, stretched exponential (up to 5 peaks)
Anisotropy	up to 3rd order exponential decay model, tail fit of the anisotropy decay and anisotropy reconvolution
Decay parameters	amplitudes, lifetimes, distribution width, background
Anisotropy parameters	G-factor, amplitude, background
Reconvolution parameters	Background, time shift, scattered light contribution, pulse repetition rate

Algorithms	
Nonlinear least squares fitting / MLE	Marquardt-Levenberg, Monte Carlo, manual parameter variation
Correction for finite IRF	Iterative reconvolution
Error test / assessment	$\chi 2$, distribution and autocorrelation of weighted residuals
Error analysis	Bootstrap
Global analysis / batch mode fitting	For all fitting models, number of data sets only memory limited

User interface	
Graphical user interface	Windows™ based GUI
Display	Linear or logarithmic scale, zoomable
Data import	ASCII file or from Windows clipboard (HydraHarp 400, PicoHarp 300, TimeHarp 260, MultiHarp 150, NanoHarp 250)

Data formats	
Number of channels	unlimited
Channel width	unlimited
Supported devices	FluoTime 250 and 300 spectrometer, HydraHarp 400, PicoHarp 300, Time-Harp 260, MultiHarp 150, NanoHarp 250 (binary or clipboard) and ASCII

Operation	
PC requirements	CPU: min. 2 GHz, RAM: min 2 GB
Display	1024 × 768 (or better)
Operating system	Windows™ 8.1 or 10
Protection module	USB