

Fit a decay curve with a distribution of decay rates

Last revised: 2016-12-20

Initialize

Models

===== Data file =====

```
Load := ( FOLDER("data")  
          FILE("decay1.dat")  
          BOXCAR(5)  
          XSCALE(0.001)  
          YSCALE(10-6) )
```

Working directory: CWD = "G:\Kood\Mathcad\McadApps\Distribution of decay rates\
Options: FILE, TPC, THR, INDEX, STRIP, TIME, BOXCAR, SKIP, XSCALE, YSCALE,
Click [here](#) for help

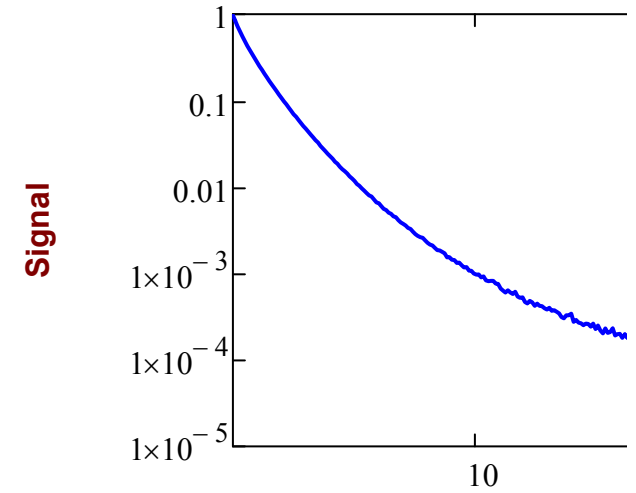
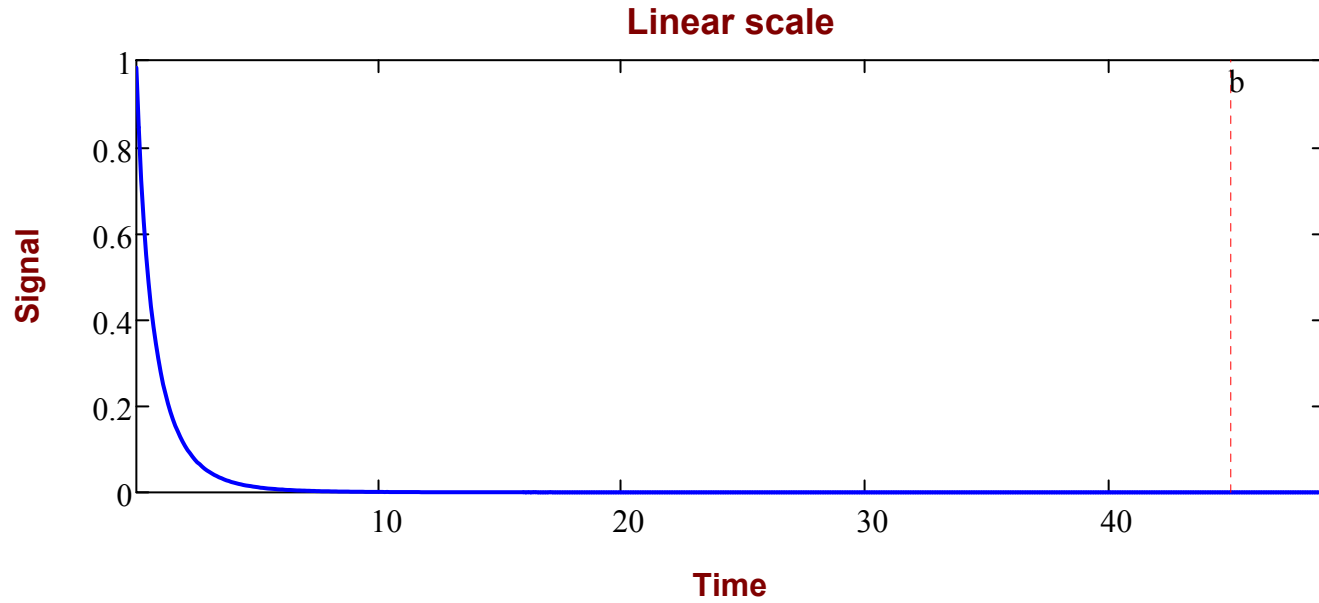
Processing

=====**Fitting range**=====

$\Delta T := (0 \ 45)$

Define ΔT for time range or ΔI for index range

Processing



=====**Statistical weight**=====

Noise(S) := \sqrt{S}

Description := "Shot noise"

Define a function describing how the noise amplitude depends on the strength of signal. Click [here](#) for help

Temporary data

=====**Decay model and guess values**=====

Model := LOGNORM

$\begin{pmatrix} \text{Amplitude} \\ \text{DistParam} \\ \text{Offset} \end{pmatrix} := \begin{pmatrix} 1 \\ 0.75 \\ 0.5 \\ 5 \times 10^{-5} \end{pmatrix}$

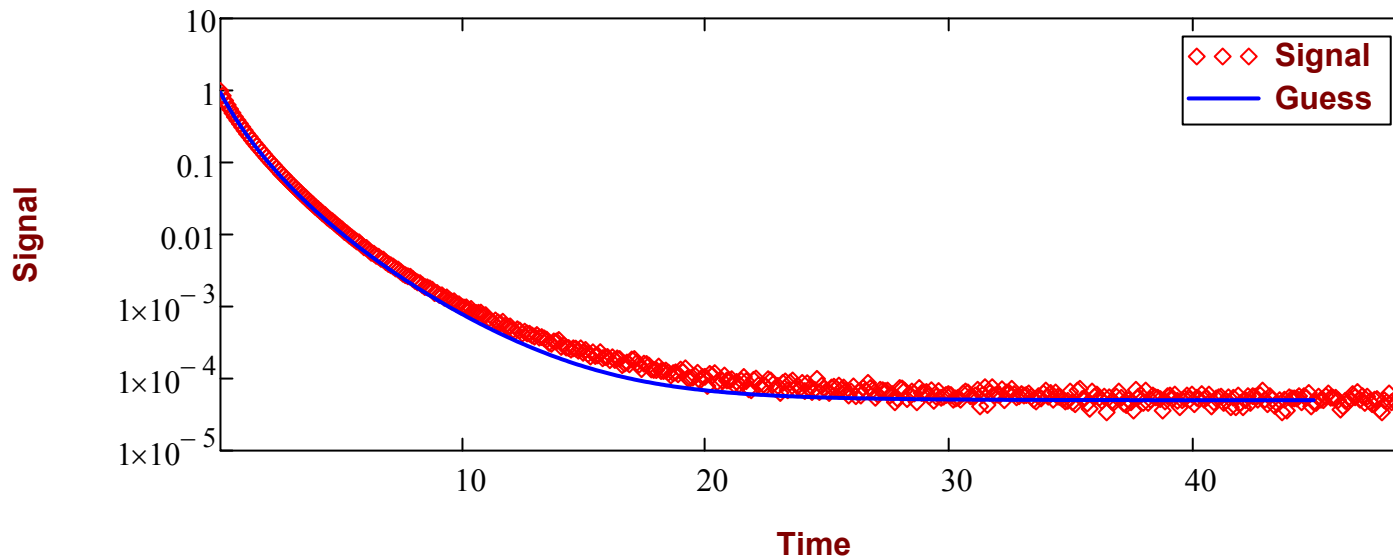
FixOffset := FALSE

LOGNORM Decay with log-normal distribution of decay rates
WEIBULL Decay with Weibull distribution of decay rates
BECQ Becquerel decay function (gamma-distribution of decay rates)
FORSTER Förster energy-transfer model
Click [here](#) for help

INFO_{Model} = $\begin{pmatrix} \text{"Decay with log-normal distribution of decay rates"} \\ \begin{pmatrix} \text{"Characteristic time constant"} \\ \text{"Shape parameter [spread of ln(k)]"} \end{pmatrix} \end{pmatrix}$

Set FixOffset to TRUE to disable optimization of the offset value.

Processing



Quality of guess

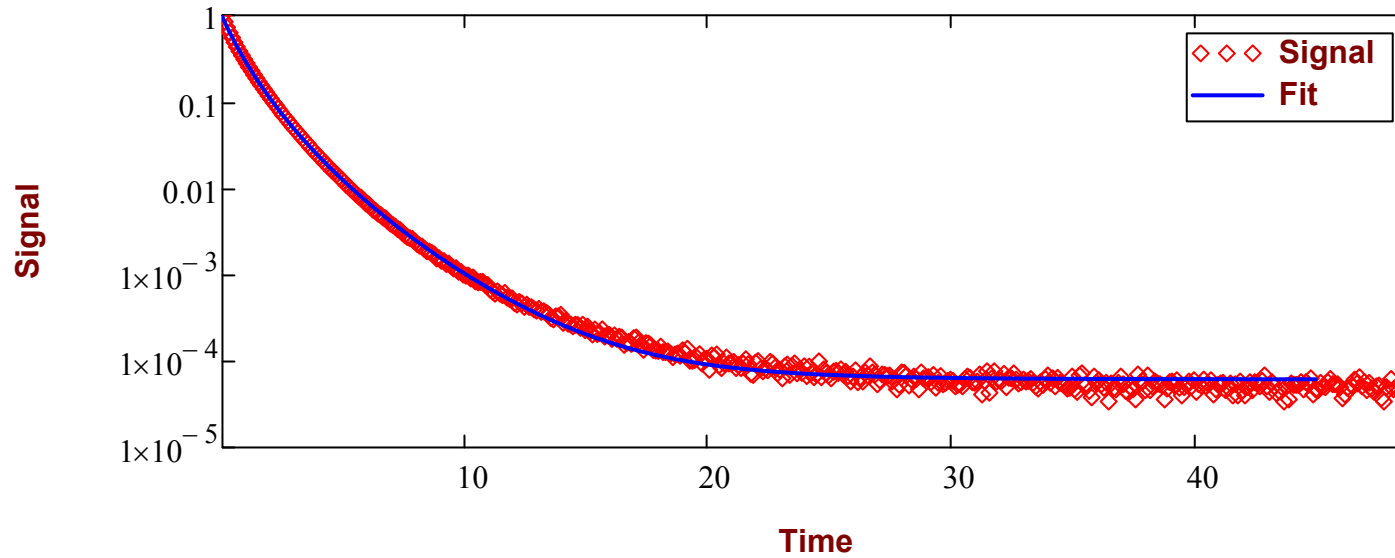
$$\chi^2 = 89.189$$

Optimization

Processing

$$\begin{pmatrix} \text{Amplitude} \\ \text{DistParam} \\ \text{Offset} \end{pmatrix} = \begin{bmatrix} 1.02560365 \\ 0.76016116 \\ 0.52201373 \\ 6.14142304 \times 10^{-5} \end{bmatrix}$$

AverageDecayTime = 1.144



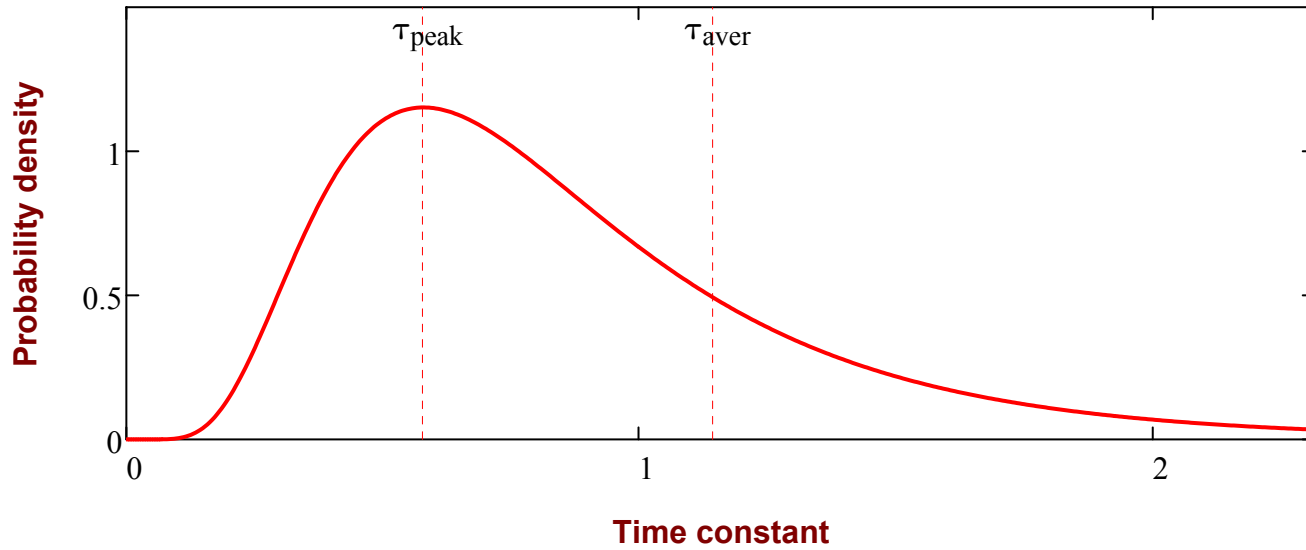
Quality of fit
 $\chi^2 = 6.479$

===== **Distribution of decay times** =====

Display range relative to the peak position: **Range := 4**

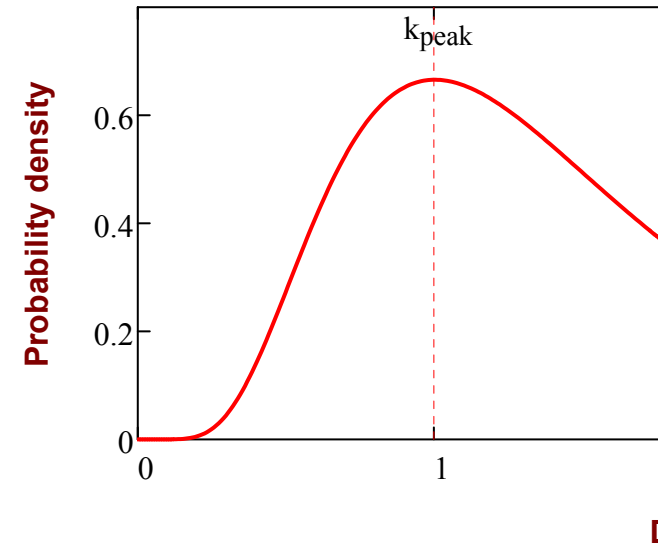
▶ Processing

Distribution of decay times



Peak position: **$\tau_{\text{peak}} = 0.579$**


Distributi



Peak pos

===== **Save data** =====

Subtract offset before saving processed decay curves: RemoveOffset := TRUE

 Processing

Processed experimental curve was written to ExpFile = "decay1.exp.txt"

Optimized model curve was written to FitFile = "decay1.fit.txt"

Report was written to RepFile = "decay1.report.txt"