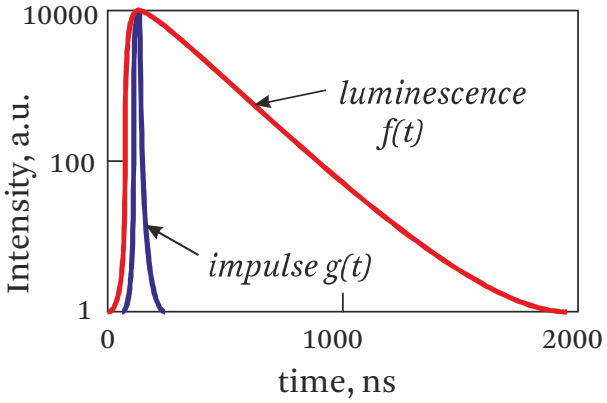
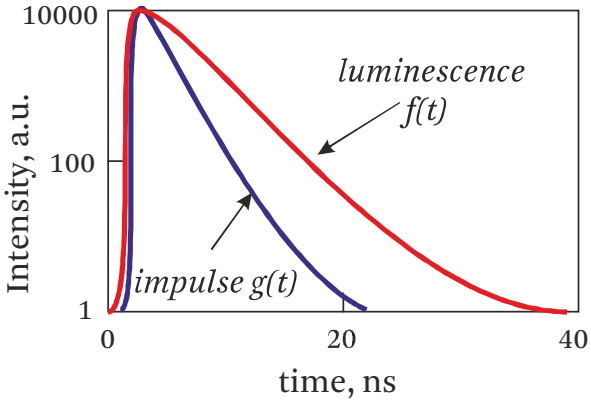
***Output signal (convolution of luminescence and input impulse):***

$$y(t) = f(t) * g(t)$$

Typical scintillator




Fast scintillator




## I. Fast Fourier transform:

$$y(t) \to Y(\omega),\ f(t) \to F(\omega),\ g(t) \to G(\omega)$$

$$F(\omega) = \frac{Y(\omega)}{G(\omega)}$$

Tikhonov regularization:
[http://www.ees.nmt.edu/outside/courses/GEOP505/Docs/deconv.pdf]

$$F = \frac{YG^*}{\left(GG^* + \lambda\right)} \xrightarrow{inverse\ FFT} f(t)$$

λ – small positive value (regularization parameter)

## II. Nonlinear model for fitting (regression):

$$f(t) = I_0 \exp\left(-t/t_0\right)$$

$$y(t) = \int_0^t f(\tau)\, g(t-\tau)\, d\tau$$

Parameters $I_0$, **$t_0$ (decay kinetic constant)**

Data – $BaF_2$ nanoparticles (size 20-120 nm)
[http://dx.doi.org/10.1063/1.4892112]