

## Qensh fitting routine.

**Function name: *Fit3\_sqw\_se\_in\_w\_lor***

**Summary:** This function performs the fit of the experimental data to a sum of a stretched exponential and a Lorentzian line.

**NB:** In the case  $\beta=1$ , this is equivalent to a fit to a sum of two Lorentzians.

**Details:** data are fitted to the following  $S(Q, \omega)$ :

$$S(Q, \omega) = S_{core}(Q, \omega') \otimes R(\omega) + Background(\omega) + \alpha.S_{Buffer}(Q, \omega)$$

where

$$S_{core}(Q, \omega') = I_{El} \cdot \delta(\omega') + \left[ \frac{I_{SE}}{2\pi} \int \exp\left(-\left(\frac{t}{\tau_{SE}}\right)^\beta \cos(\omega' t)\right) + \frac{I_B}{2\pi} \frac{\Gamma_L}{\Gamma_L^2 + \omega'^2} \right] \cdot \exp\left(\frac{\omega'}{k_B T}\right)$$

and  $\omega' = \omega - \omega_0$

and  $Background(\omega) = \frac{bckd(\omega_{max}) - bckd(\omega_{min})}{\omega_{max} - \omega_{min}} \cdot (\omega - \omega_{max}) + bckd(\omega_{max})$

Param. #	symbol used in Eq. above	name	unit
0	$\omega_0$	Elastic Peak Shift	meV
1		Resolution Shift	meV
2		Buffer Shift	meV
3	T	Sample Temperature	K
4	$\alpha$	weighting factor for Buffer or substrate subtraction	
5	$bckd(\omega_{min})$	Background level at $\omega_{min}$	A.U.
6	$bckd(\omega_{max})$	Background level at $\omega_{max}$	A.U.
7	$I_{el}$	Elastic Peak Intensity	A.U.
8	$I_{SE}$	Stretched Exponential Intensity	A.U.
9	$1/\tau_{SE}$	Stretched Exponential correlation time	meV

10	$\beta$	Stretching exponent	
11	$I_B$	Lorentzian Intensity	A.U.
12	$\Gamma_L$	Lorentzian HWHM	meV

Note: Only the parameters highlighted in yellow should be used.