**Linearization**

At this point, noise and background were either eliminated or reduced, and the resolution was improved by. It is nevertheless very important to notice that the brightness of each fluorophore is greatly affected in the process of cross-cumulant computation which, at high orders, alters dramatically the contrast of the SOFI image: small differences in brightness between fluorophores are severely amplified. For example, an emitter that has a 2-fold larger molecular brightness than another will appear times brighter than the other in the nth order SOFI image. In addition, an emitter that does not fluctuate over time will yield a null cumulant and will thus not appear in the SOFI image. These issues will thereafter be respectively referred to as **amplified brightness** and **blinking heterogeneities**.

The flattened nth order cross-cumulant can be described by the following equation:

where is a time-varying stochastic signal that equals 1 when the emitter is in the on-state and when it is in the off-state. The relative durations of the on and off-states are respectively:

This blinking behaviour can thus be described by:

defined by a Bernouilli distribution with probability . In other words, the fluorophore is either in the on state with probability or in the off-state with probability . Therefore, the cumulant of the stochastic signal is:

With and

Combining this result with equation (1) leads to the following nth order cross-cumulant:

where both and were written to vary according to spatial coordinates instead of individual fluorophores (i.e. ).

In order to correct for the amplified brightness , the cumulants are deconvolved with an estimate of the point-spread function. Assuming a perfect deconvolution, the result can be interpreted as follows:

Since each point-spread function has been reduced to a Dirac pulse, taking the nth root linearizes the brightness response without cancelling the resolution improvement of the cumulant. The linearized cumulant can be expressed by: