Karlsruhe Institute of Technology

FAKULTÄT FÜR PHYSIK
Praktikum Klassische Physik

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Datum: Handzeichen:

Bemerkungen:

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1. Theory of FCS

1.1. FCS Basic Idea

As previously stated, FCS observes the brightness of the radiation emitted from the probe through the use of highly sensitive photo diodes. To distinguish the emitted radiation from the radiation used to illuminate the probe, the frequencies of both light sources need to be different. This is accomplished by using specialized fluorophores specifically designed for the purpose of FCS. The underlying Idea of the FCS is to measure the fluctuations of the emitted radiation intensity rather that measuring the intensity itself. Through autocorrelation of the signal, the time-scales of the different fluctuations can be measured along with the concentration of the emitting molecules in the solution. As the fluctuations of the intensity in comparison to the overall intensity reduce as the number of illuminated particles increases, it is very important to keep the overall amount of illuminated particles below a certain number. As the number of illuminated molecules is described by the poisson equation the fluctuations are proportional to it's uncertainty, which is:

$$\delta F \propto \frac{\sqrt{\langle (\delta N)^2 \rangle}}{\langle N \rangle} \tag{1.1}$$

The fluctuations are defined as:

$$\delta F(t) = F(t) - \langle F(t) \rangle = F(t) - \frac{1}{T} \int_0^T F(t) \mathrm{d}t \tag{1.2}$$

When using FCS, the amount of molecules that are illuminated are controlled by the size of the confocal volume. Only inside the confocal volume is the intensity of the illuminating laser high enough to excite the fluorophores. As such the fluctuations of the intensity δF can also be written as

$$\delta F(t) = \kappa \int_V I_{ex}(\vec{r}) S(\vec{r}) \cdot \delta(\sigma q C(\vec{r}, t)) \mathrm{d}V \tag{1.3}$$

3. Auswertung

Ganz tolle Auswertung des Versuchs. [**?**]

Anhang

A. Erster Abschnitt des Anhangs

Dies ist der erste ganz tolle Abschnitt des Anhangs.