Frequency resolved depolarized dynamic light scattering of self-aggregating mononucleotides in solution with a custom built setup

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In some cases the rotational diffusion of particles in the nanometer scale is too fast to be easily resolved with conventional photon correlation spectroscopy (PCS) methods. Therefore a custom built depolarized light scattering apparatus equipped with a confocal Fabry-Perot interferometer (FPI) with a free spectral range of 150 MHz was developed [1]. The FPI is used to analyze the scattered light in the frequency domain. This is an important characteristic because the rotational motion of the particles modify the depolarized component of the scattered light.

The original setup [1] was extended with a second photomultiplier tube. Furthermore, the depolarization process is performed after the frequency analysis.

Due to this enhanced simultaneous measurement of both, the broadened depolarized and the instrumental line, it is easily possible to accumulate the noisy component efficiently leading to an enhancement of the signal to noise ratio. As a proof of principle for the experimental technique we studied interesting self-assembly of mononucleotides in aqueous solution [2]. Self-aggregation phenomena as well as the interaction of the mononucleotides uridine-5'-monophosphate and cytidine-5'-monophosphate can be analyzed precisely.