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Optimum Drift Velocity for Single Molecule Fluorescence Bursts in Micro/Nano-Fluidic Channels

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Photonic burst histograms can be used to identify single protein molecules in micro/nano-fluidic channels provided the width of the histogram is narrow. Photonic shot noise and residence time fluctuations, caused by longitudinal diffusion, are the major sources of the histogram width. This Communication is a sequel to an earlier Letter of ours [L. L. Kish et al., Appl. Phys. Lett. 99, 143121 (2011)] and demonstrates that, for a given diffusion coefficient, an increase of the drift velocity enhances the relative shot noise and decreases the relative residence time fluctuations. This leads to an optimum drift velocity which minimizes the histogram width and maximizes the ability to identify single molecules, which is an important result for applications.

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