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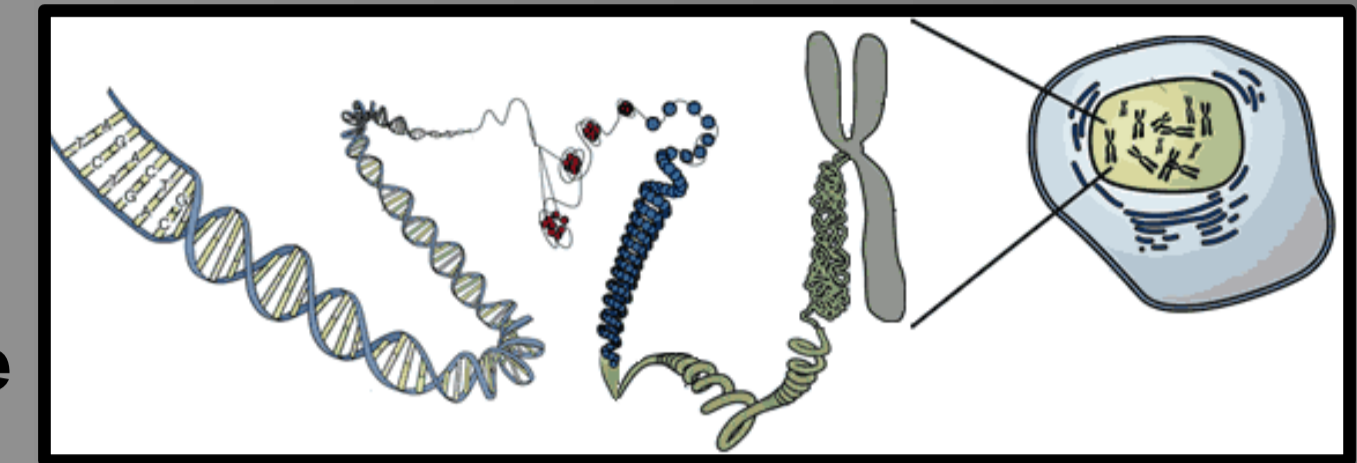
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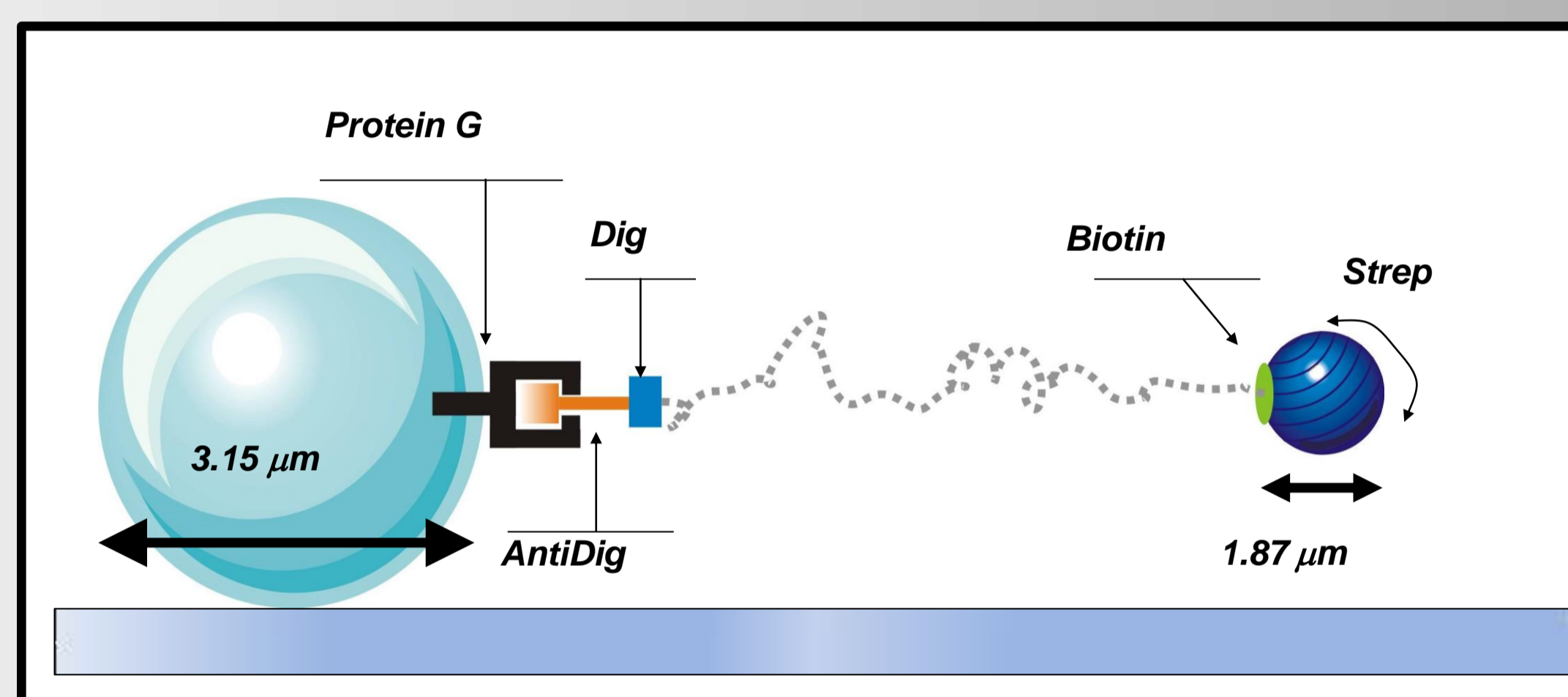
1.-Introduction

DNA is the basis of life as we know. To achieve transcription, translation and replication, DNA needs to break the tertiary structure. Important point here is the order of magnitude difference between length of cell nuclei (around microns of size) and total extension of DNA (some chromosomes achieve length up to 11 centimeters).



How can DNA retain its properties even when it is so tightly packed? What is the nature of the force acting at different magnitude of stretching? In this experiment we study the behavior of single λ -DNA (4.1 μm) with the help of optical tweezers and analyze the changes happening in power spectral density (PSD) of bead attached to it in relaxed and stretched state of the DNA. We aim to show that a non-white noise appears when DNA is stretched contrary to what is predicted by WLC model.

2.- How is the DNA molecule attached?

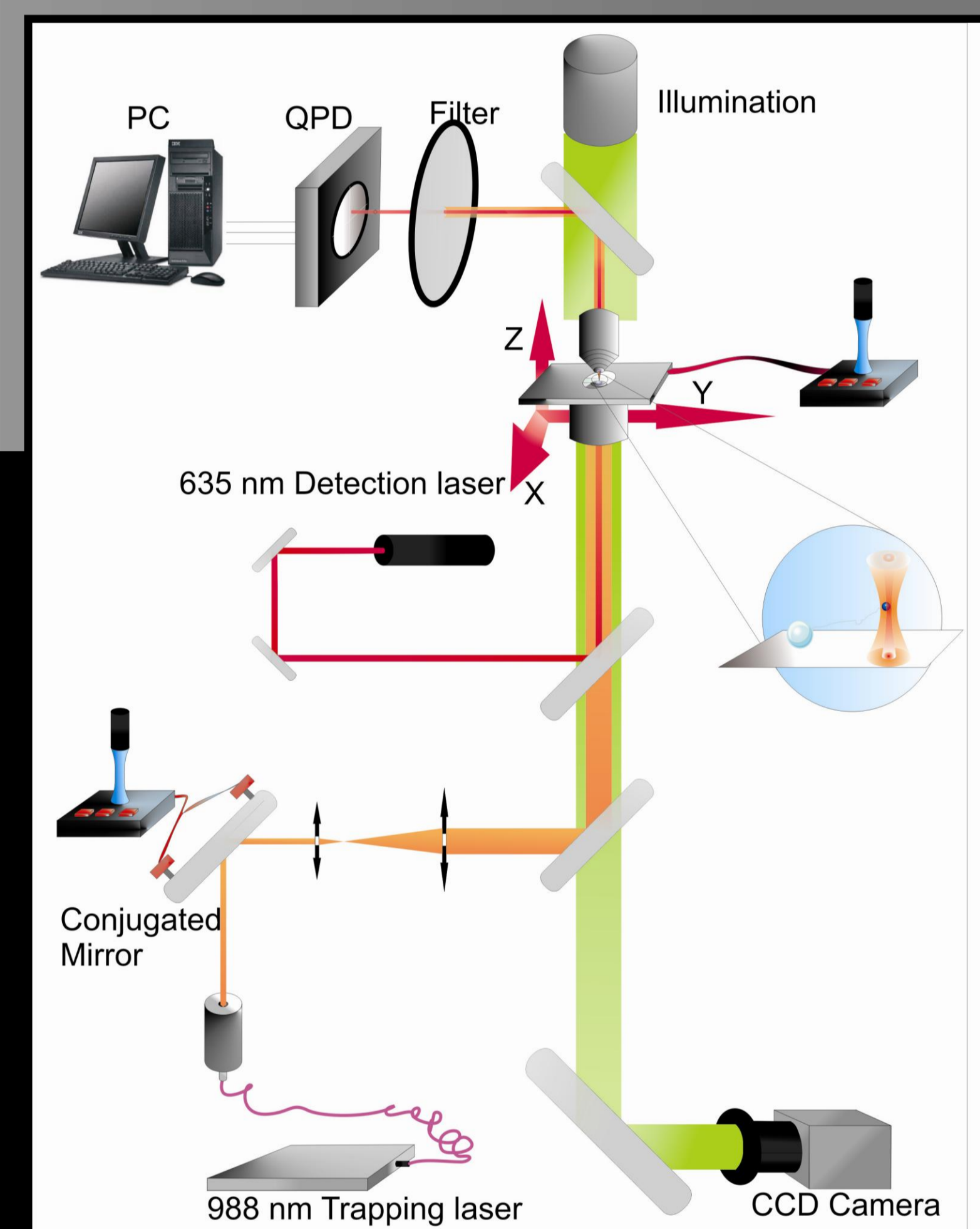


3.- Optical setup

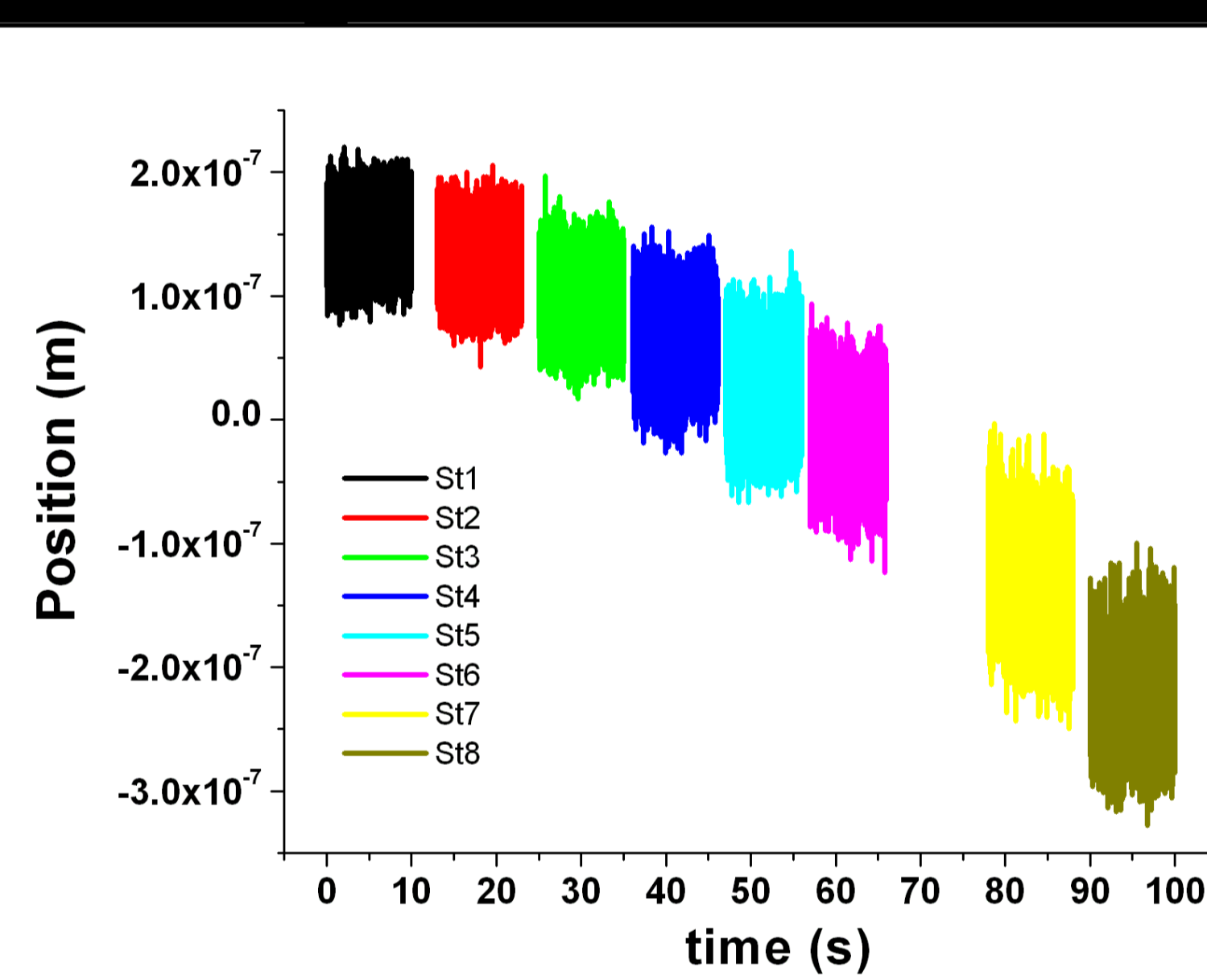
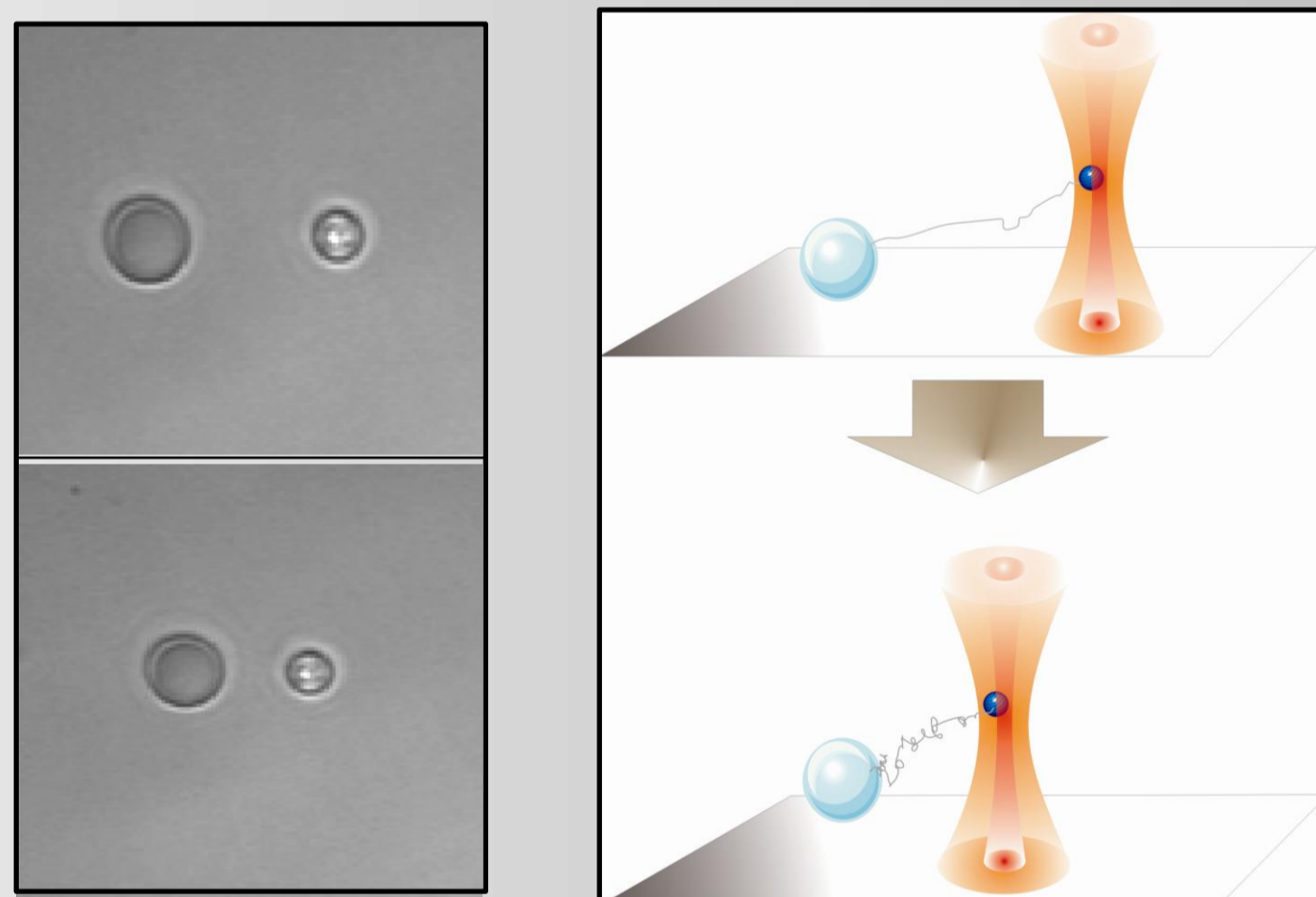
An inverted microscope with a 100X, high NA immersion oil objective is used to focus the 985 nm trapping laser and the 635 nm detection laser.

The position of the small bead is sampled at 50 kHz.

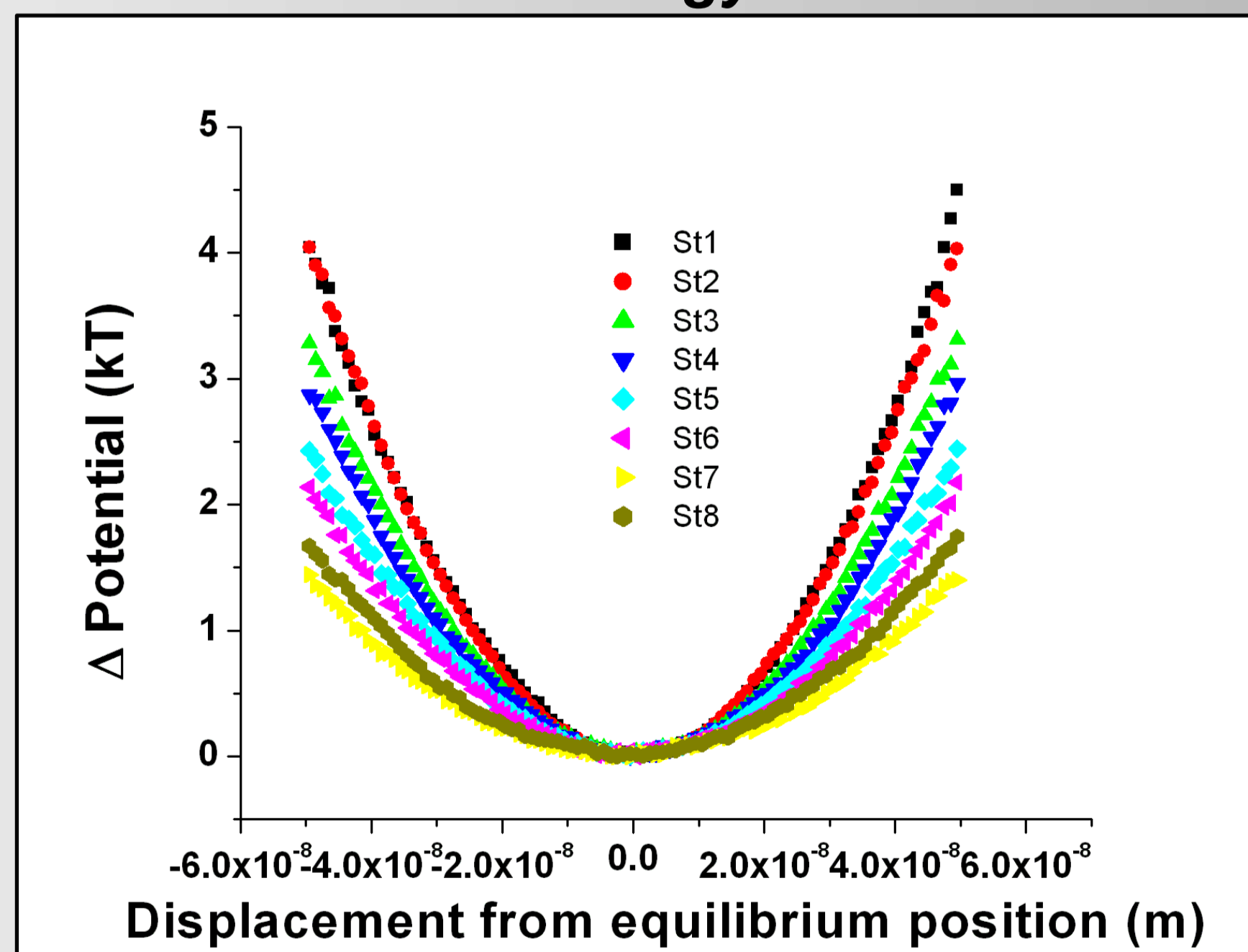
The sample and trapping laser are electronically controlled by joysticks.



4.- Experimental procedure

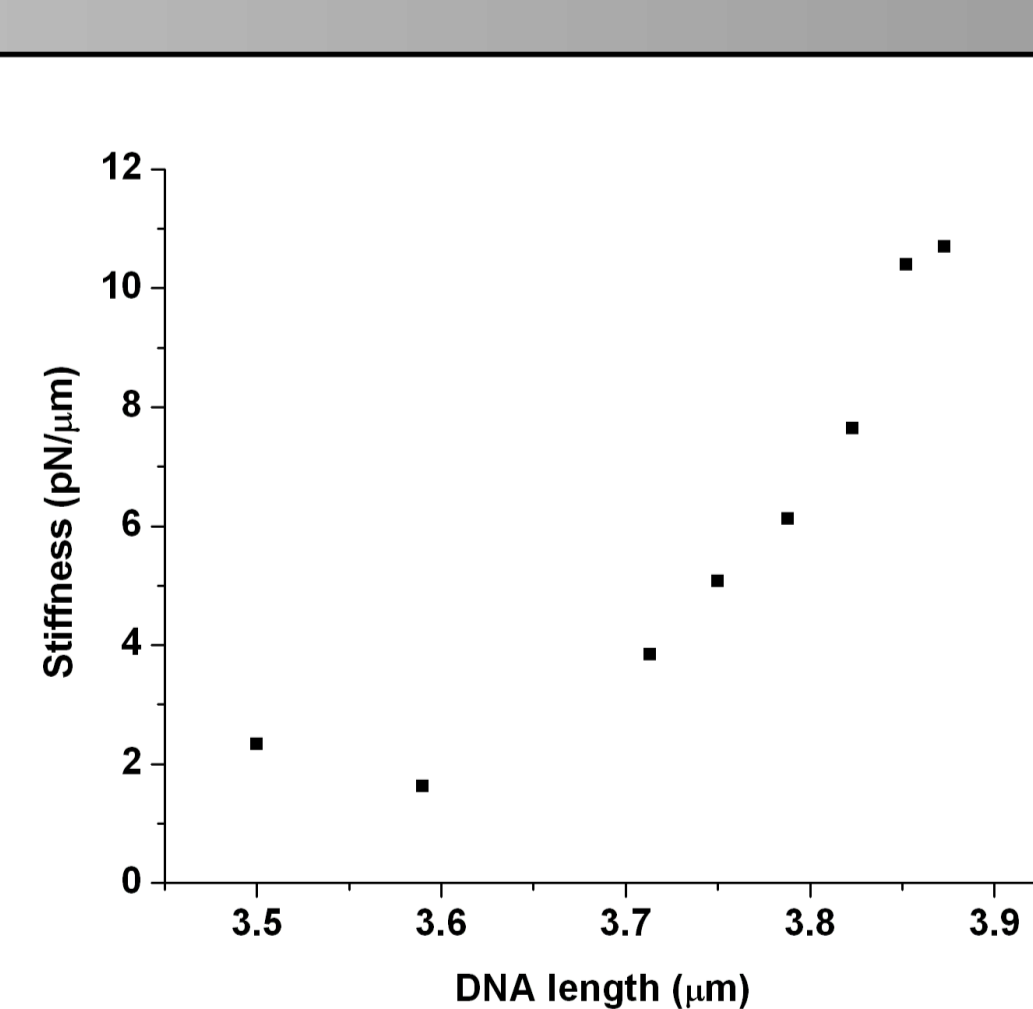


Potential energy of the bead

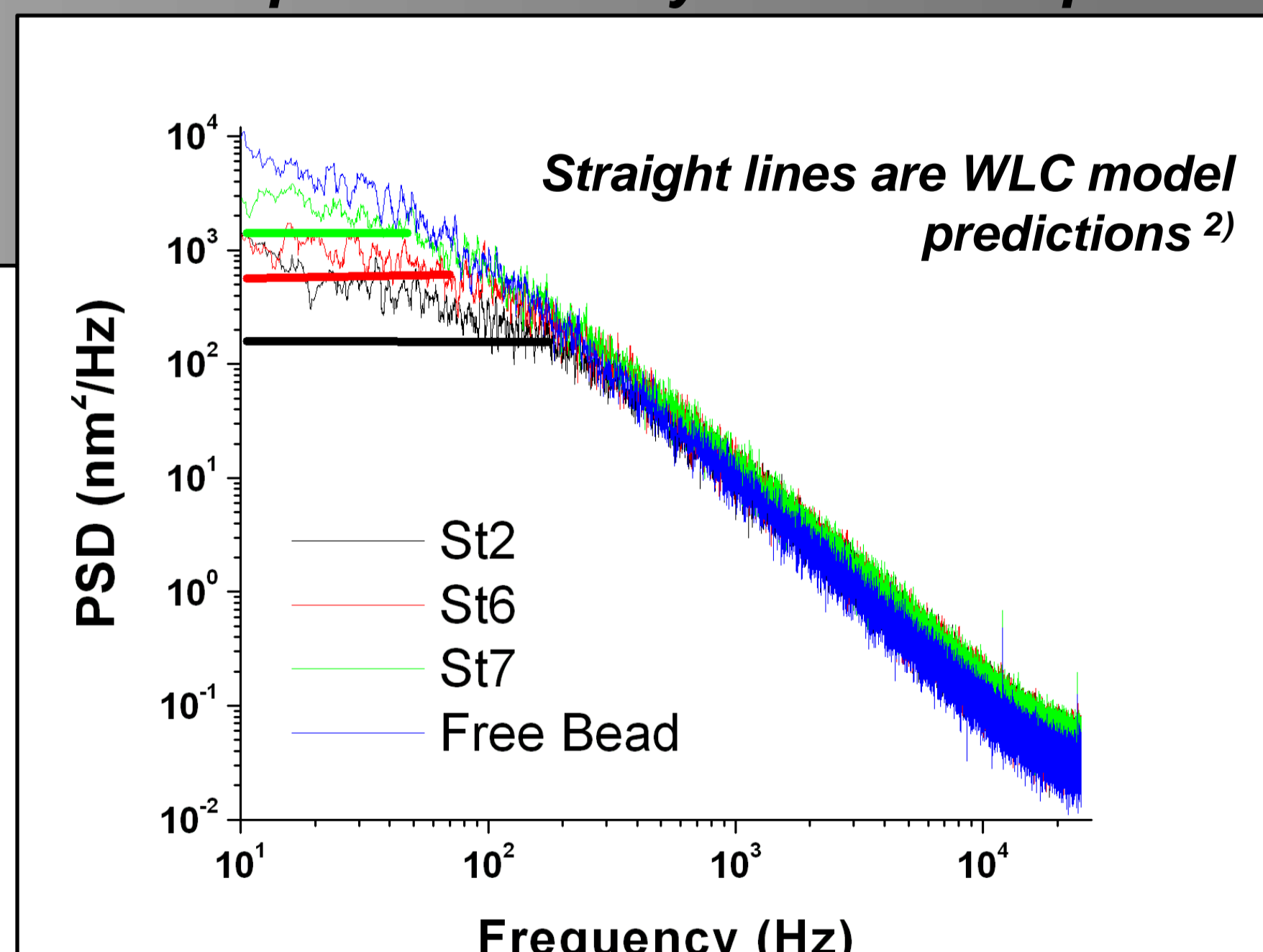


5.- Results

Extension curve ¹⁾



Power spectral density of the bead position



6.- Conclusions

Optical trapping allow to investigate the dynamics of a single DNA molecule. Analyzing the displacement histogram provides information on the variation of the potential energy along the DNA axis and perpendicular to it. This potential gives us the DNA stiffness at different stretching steps. When we study the PSD, non white noise appears which WLC model predicts flat zone. Future work will concentrate on removal of PSD data of free bead in the trap from PSD data of the bead attached to the DNA

7.- References

- 1) J. Meiners *et al*, "Femtonewton Force Spectroscopy of single extended DNA molecules", *PRL* 84, 2000, 5014
- 2) C. Bustamante *et al*, "Entropic elasticity of λ -phage DNA", *Science*, 265, 5178, 1599-1600

8.- Acknowledgements:

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