Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Object-adapted trapping and shape-tracking to probe a bacterial protein chain motor JULIAN ROTH, MATTHIAS KOCH, ALEXANDER ROHRBACH, University of Freiburg — The helical bacterium Spiroplasma is a motile plant and anthropod pathogen which swims by propagating pairs of kinks along its cell body. As a well suited model system for bacterial locomotion, understanding the cell's molecular motor is of vital interest also regarding the combat of bacterial diseases. The extensive deformations related to these kinks are caused by a contractile cytoskeletal protein ribbon representing a linear motor in contrast to common rotary motors as, e.g., flagella. We present new insights into the working of this motor through experiments with object-adapted optical traps and shape-tracking techniques. We use the given laser irradiation from the optical trap to hinder bacterial energy (ATP) production through the production of O_2 radicals. The results are compared with experiments performed under the influence of an O_2-Scavenger and ATP inhibitors, respectively. Our results show clear dependences of the kinking properties on the ATP concentration inside the bacterium. The experiments are supported by a theoretical model which we developed to describe the switching of the ribbon's protein subunits.

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Date submitted: 13 Nov 2014 Electronic form version 1.4