

Abstract Submitted
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Direct measurement of the propulsion efficiency of bacterium *Escherichia Coli* SUDDHASHIL CHATTOPADHYAY, RADU MOLDOVAN, Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, PA 15260, CHUCK YEUNG, School of Science, Pennsylvania State University at Erie, The Behrend College, Erie, PA 16563, XIAO-LUN WU, Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, PA 15260 — Swimming of flagellated bacterium in an aqueous medium is studied in vivo with the aid of optical tweezers and an imposed external flow. By trapping the bacterium perpendicular to the optical axis, the beating frequency of the flagellum ω and the counter rotation of the cell body Ω can be measured simultaneously. Measurements of the trapping force F and the two rotation speeds, ω and Ω , enable us to determine all the elements of the propulsion matrix for individual cells as well as their statistics in a population. Further we obtain the propulsion efficiency, defined as the ratio of the input rotational power provided by the motors to the output propulsive power, to be $\sim 0.2\%$. Significant heterogeneities are observed among the bacteria despite their starting from a single colony.

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