

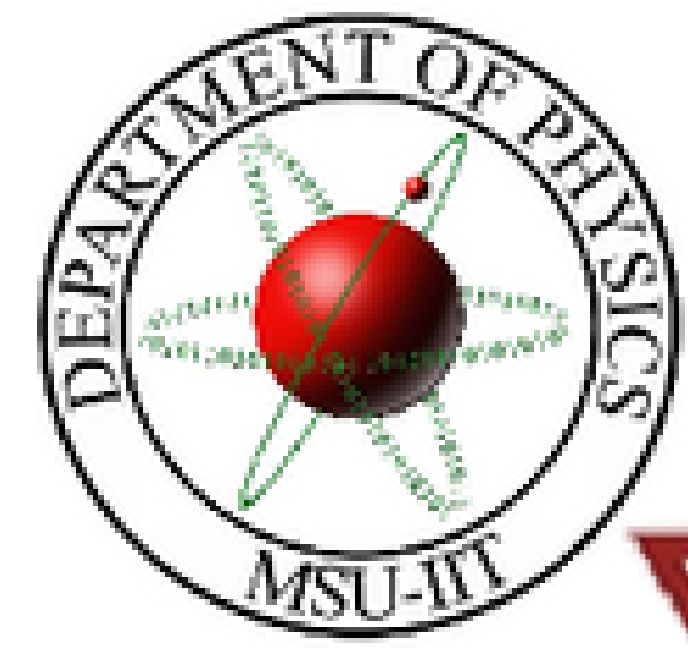


Reconstructing double well potentials via driving

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ABSTRACT

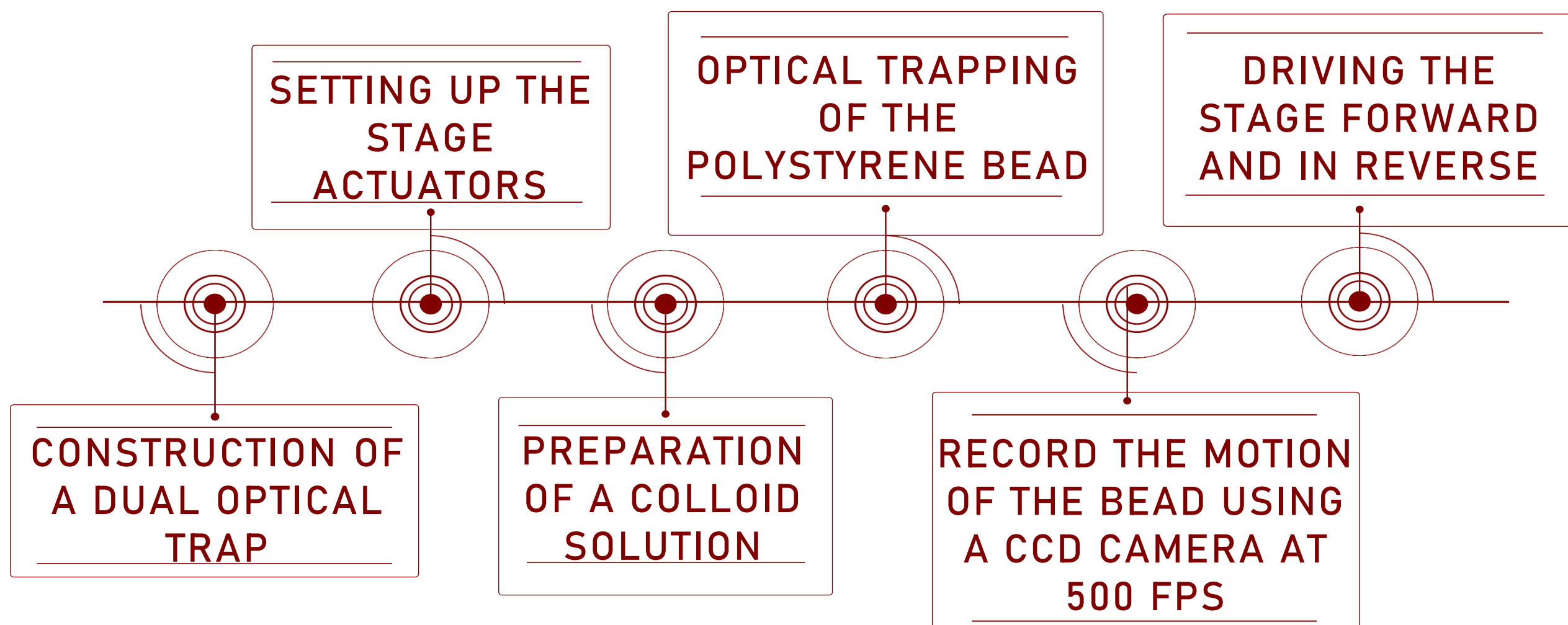
Reconstructing potential wells is inherently difficult for cases with multiple minima and high energy barriers between minima. We proposed a reconstruction protocol via small perturbations in the form of driving. To test we used a dual optical tweezer from a single light source to create a double well potential. A 1- μm polystyrene bead is trapped while the chamber is simultaneously driven. We found the bead to fluctuate between the two potential minima is enhanced by the driving.

Keywords: potential reconstruction, dual optical tweezer, driving

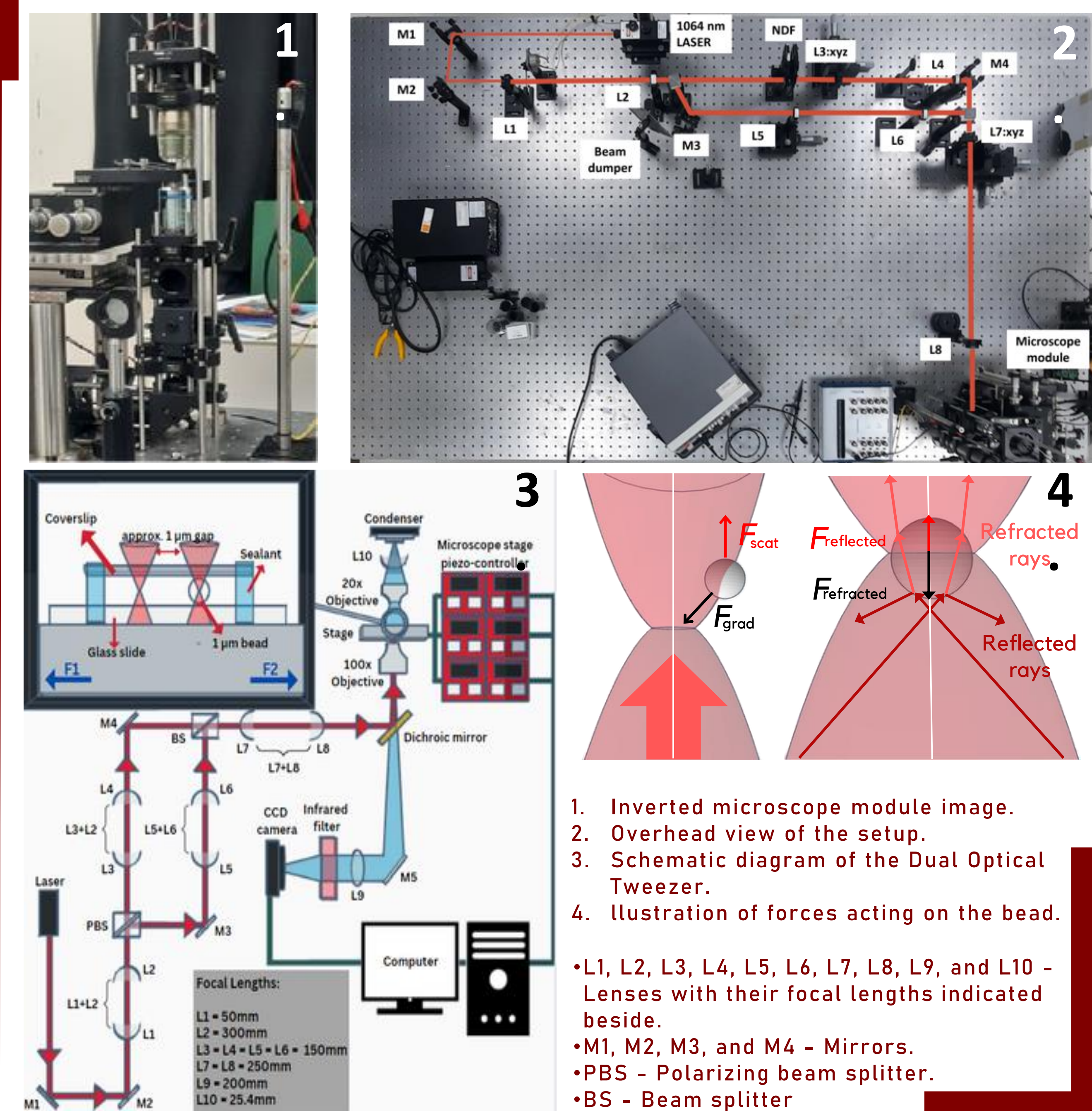
MOTIVATION

- Reconstruct the potential well of a trapped particle via weak dragging.

METHODOLOGY



EXPERIMENTAL SETUP

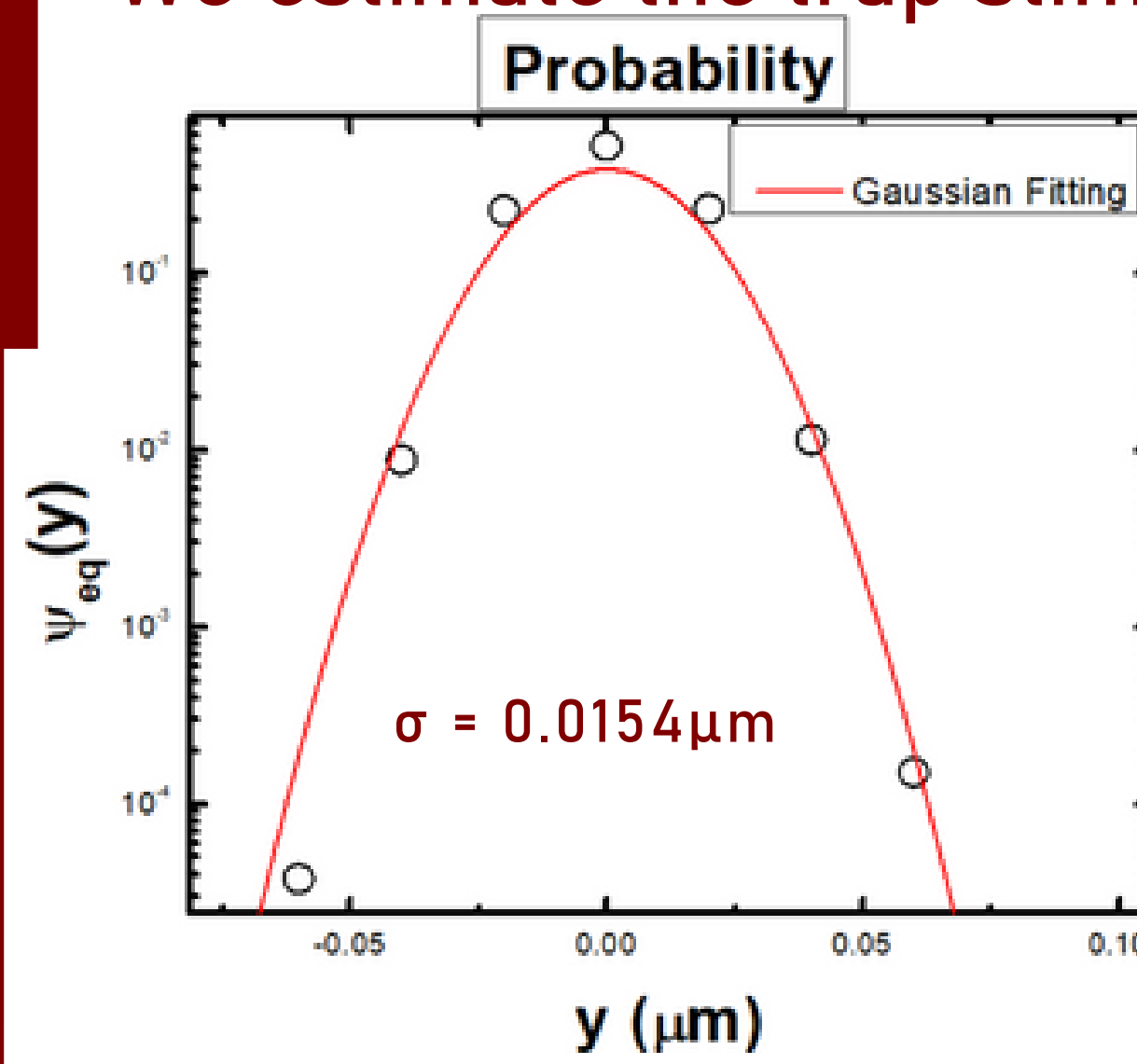


SUMMARY

- The bead travels in the same direction as the driving.
- The transfer of the bead from trap *b* to *a* takes ~ 18.2 seconds from the beginning of the forward driving.
- The transfer of the bead from trap *a* to *b* takes ~ 16.7 seconds from the beginning of the reverse driving.

OPTICAL TRAP CALIBRATION

- We estimate the trap stiffness k using the expression;



$$k_s = \frac{k_B T}{\sigma^2}$$

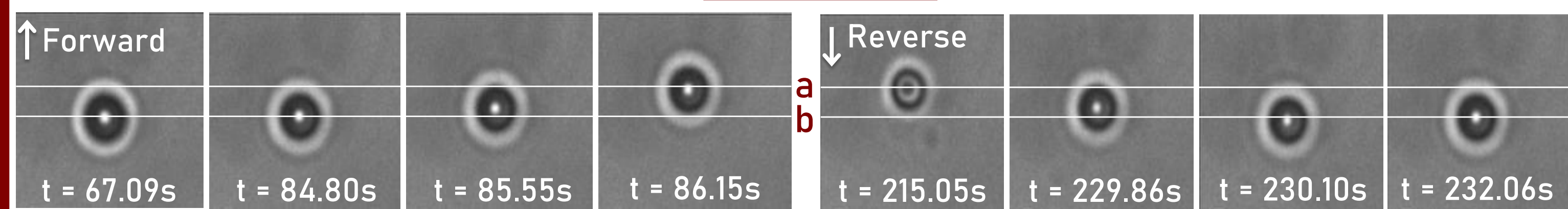
$$\Psi_{eq} = A \exp\left(-\frac{1}{2} \frac{(y-y_c)^2}{\sigma^2}\right)$$

k_B - Boltzmann's constant
 T - Temperature
 σ - Standard deviation
 y_c - Center of the trap

Stationary probability distribution of the measured position for a polystyrene bead of radius $1\mu\text{m}$ in an optical trap.

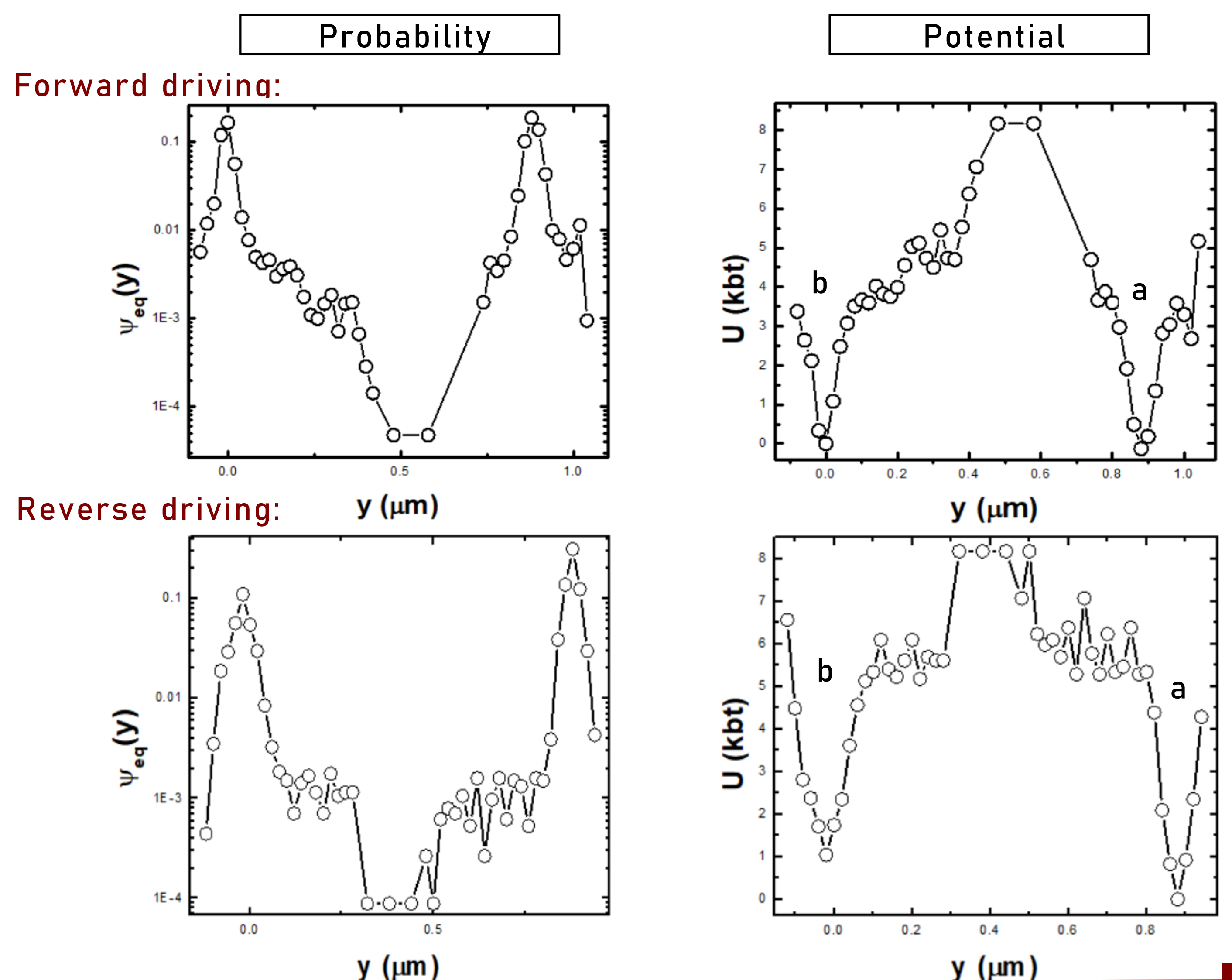
- The optical trap stiffness is; $k_s \sim 17.35 \text{ pN}/\mu\text{m}$

RESULT



- Forward driving applies a force that drives the stage to move toward the negative y -axis.
- The driving causes the bead to dislodge from trap *b* and fall into trap *a*.

- Reverse driving applies a force that drives the stage to move toward the positive y -axis.
- The driving causes the bead to dislodge from trap *a* and fall into trap *b*.



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