



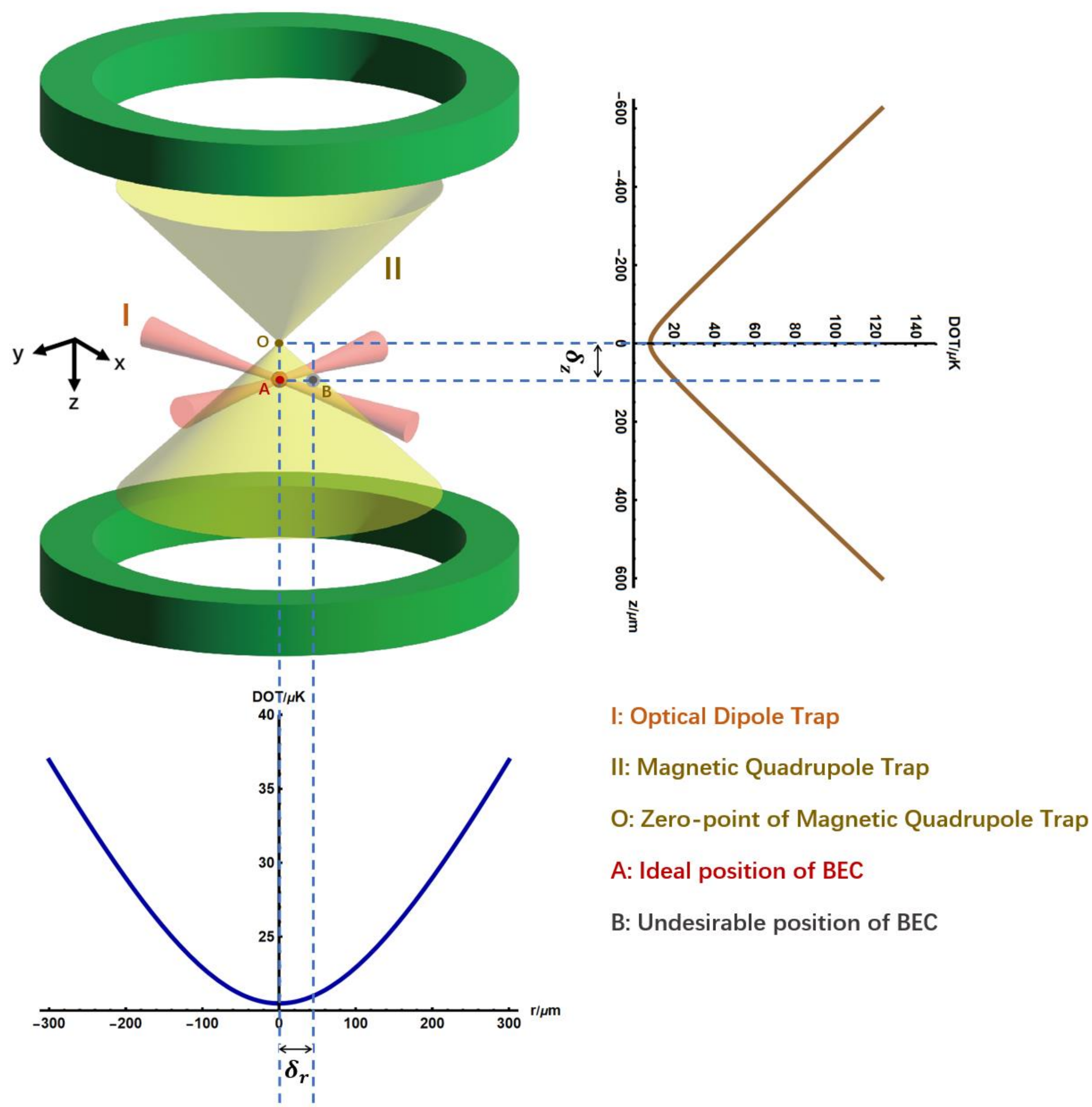
# In Situ Transfer of BEC from Optical Trap to Magnetic Quadrupole Trap

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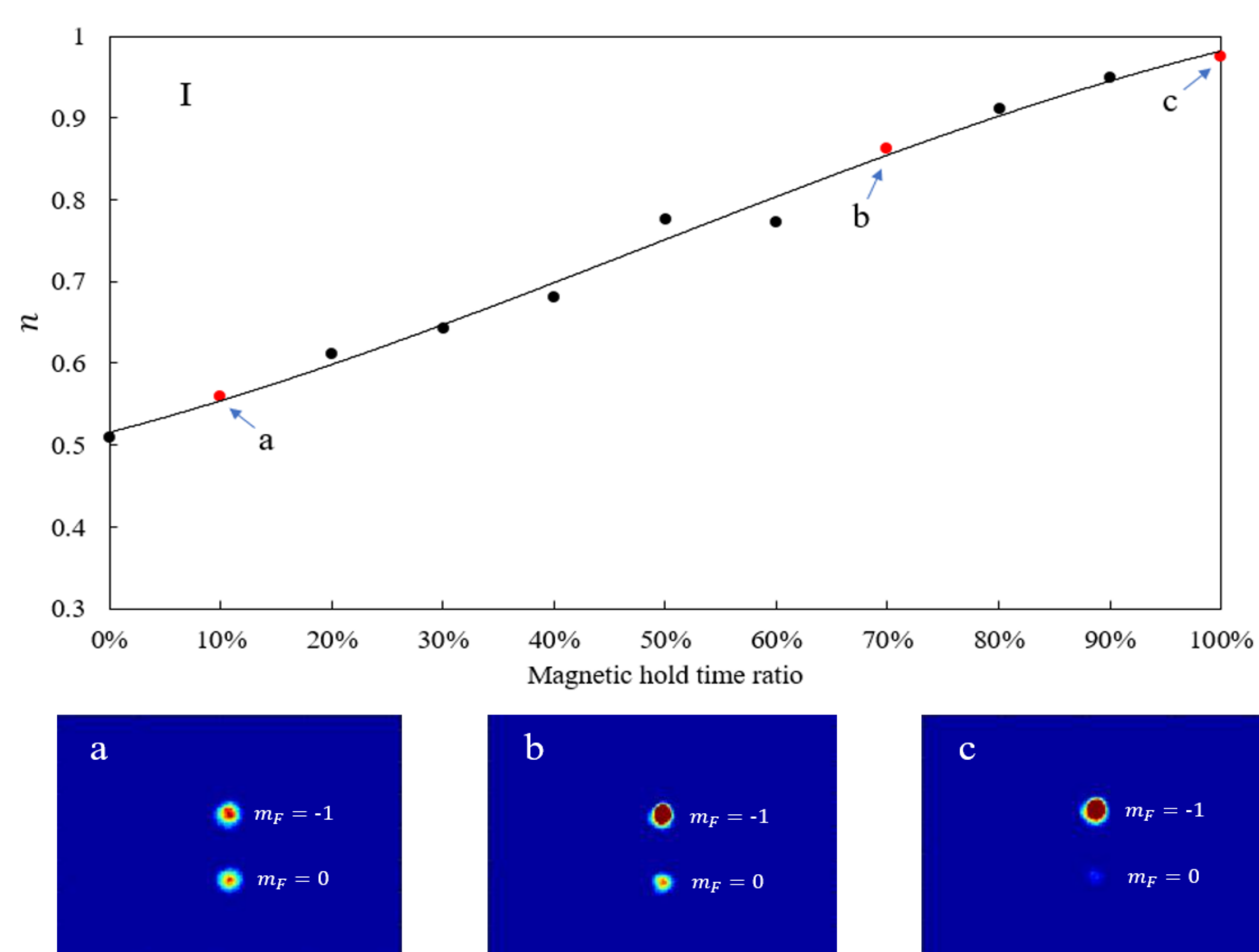
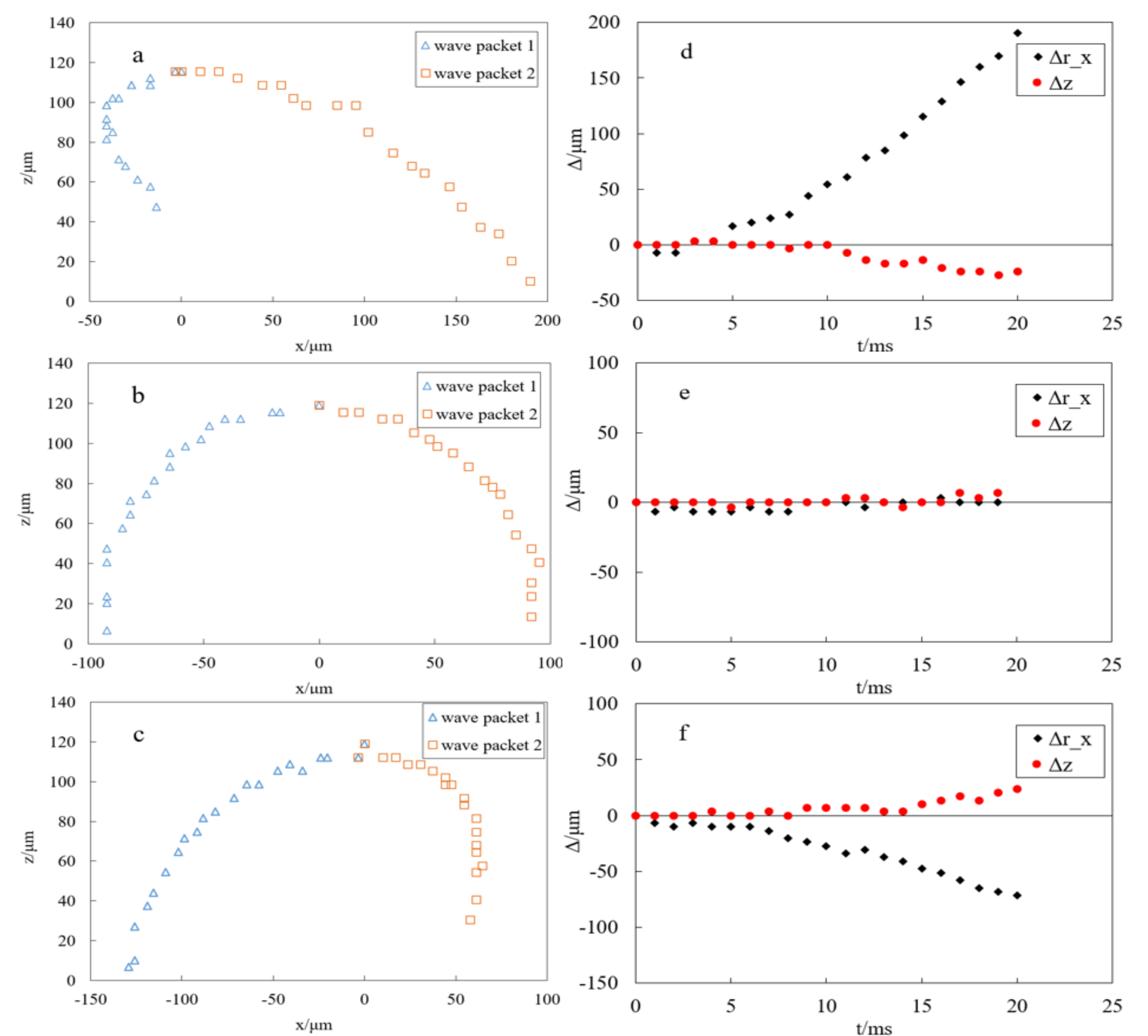
## Experimental system and key parameters



- The ideal transfer position in the experiment is point A at the  $\delta z$  distance directly below point O, and the unsatisfactory position is shown as point B, where the distance between point B and point O is  $\delta r$  in the horizontal plane. In this figure, the blue curve ① is the radial potential energy distribution of the magnetic field at the same height as point A, and the brown curve ② is the vertical potential energy distribution of the magnetic field at the same radial distance as point B. The three key parameters are:  $\delta r$ ,  $\delta z$  and  $B'$ .

## Key parameter adjustment and transfer efficiency optimization

- This series of graphs show the motion trajectories in the x-z plane of the two wave packets divided by a Bragg pulse under different magnetic fields, and the difference calculated from the motion trajectories to represent the asymmetry. a), b) and c) represent the motion trajectories of the wave packets when the control voltage of the magnetic field coils is  $B_x = 0.8, 1.23, 1.4$  V, respectively; d), e) and f) represent the asymmetry of the two wave packets in the x and z directions over time under the condition of the corresponding magnetic field.



- I) shows the relationship between the proportion of atoms in  $m_F = -1$  state and the magnetic holding time. The horizontal coordinate represents the length of the magnetic holding time, and the unit is the last magnetic holding time taken in the experiment.  $n$  is the proportion of atoms in the  $m_F = -1$  state. a), b) and c) give photos of three feature points marked in I, and the ratio of magnetic holding time of these three photos is 10%, 70%, and 100%, and the  $n$  values are 0.559, 0.862, and 0.975, respectively.