

Electrically tunable collective motion of dissipative solitons in chiral nematic films

¹Yuan Shen and ¹Ingo Dierking*

¹Department of Physics and Astronomy, School of Natural Sciences, University of Manchester,
Oxford Road, Manchester, M13 9PL, United Kingdom

E-mail: ingo.dierking@manchester.ac.uk

Supplementary Figures

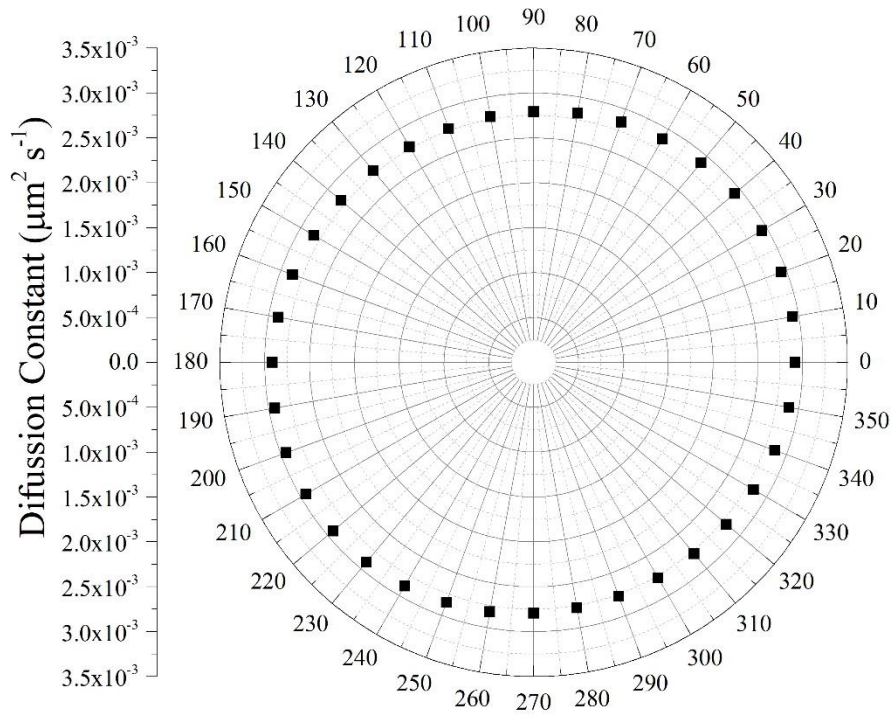


Fig. S1 Angular dependencies of the diffusion coefficient of a colloidal micro-particle in a chiral nematic. The colloidal micro-particle (diameter $\sim 3 \mu\text{m}$) is dispersed in a chiral nematic ($p \sim 2 \mu\text{m}$) which is filled in a cell ($d \sim 10 \mu\text{m}$) with planar alignment. The sample is heated to 75°C .

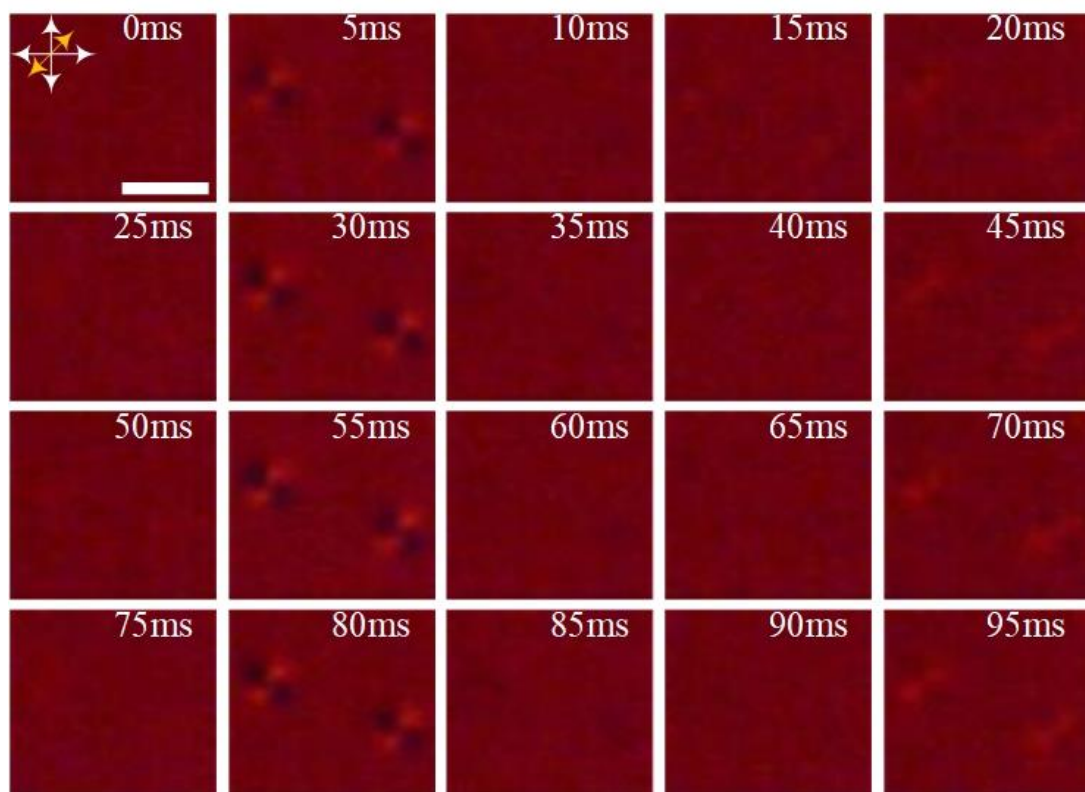


Fig. S2 Time series of polarizing micrographs of directrons. The directrons are modulated by an AC electric field of $U = 20$ V, $f = 20$ Hz. The crossed white arrows represent polarizers and the yellow arrow represent the optical axis of the λ -plate. Scale bar $10\ \mu\text{m}$.

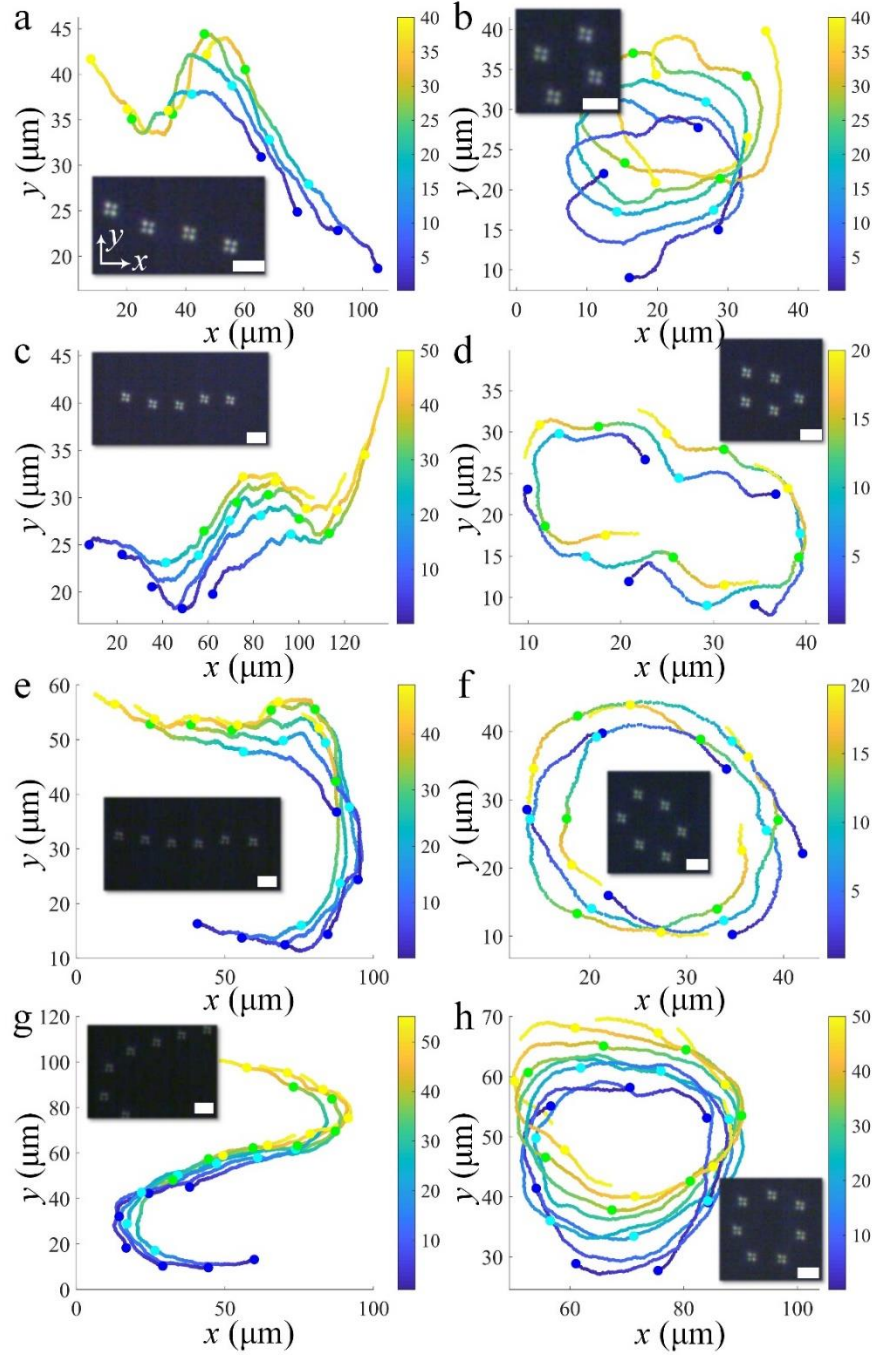


Fig. S3 Dynamics of directron flocks. Trajectories of different number of directrons colored with time corresponding to the color bars (unit (s)) at $U = 15.4$ V, $f = 100$ Hz. **a** and **b**, four directrons; **c** and **d**, five directrons; **e** and **f**, six directrons; **g** and **h**, seven directrons. In **a**, **c**, **e**, and **g**, the directrons form linear chains which move coherently. In **b**, **d**, **f**, and **h**, the directrons form closed loops which rotate continuously about their rotation axes. The insets show the micrographs of the corresponding directrons. Scale bar $10\ \mu\text{m}$. Polarizers are parallel to the x - and y -axes, respectively.

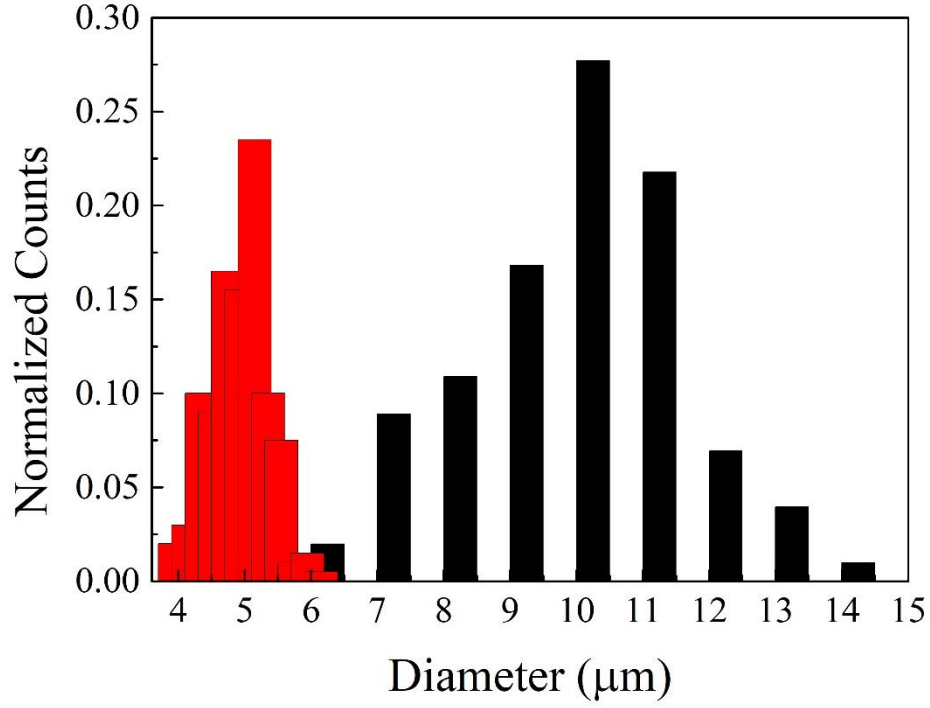


Fig. S4 Directron size distribution. The red bars represent the directrons in planar alignment cells with cell gap $d \sim 9.5 \mu\text{m}$, $U = 20 \text{ V}$, $f = 100 \text{ Hz}$. The black bars represent the directrons in planar alignment cells with cell gap $d \sim 19.7 \mu\text{m}$, $U = 100 \text{ V}$, $f = 500 \text{ Hz}$.

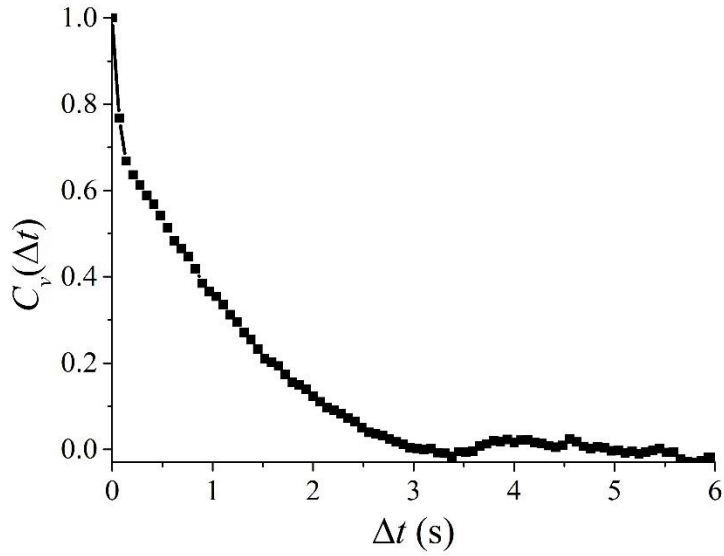


Fig. S5 Temporal velocity correlation function. The temporal velocity correlation function of directrons corresponding to Fig. 9. $U = 100 \text{ V}$, $f = 500 \text{ Hz}$.

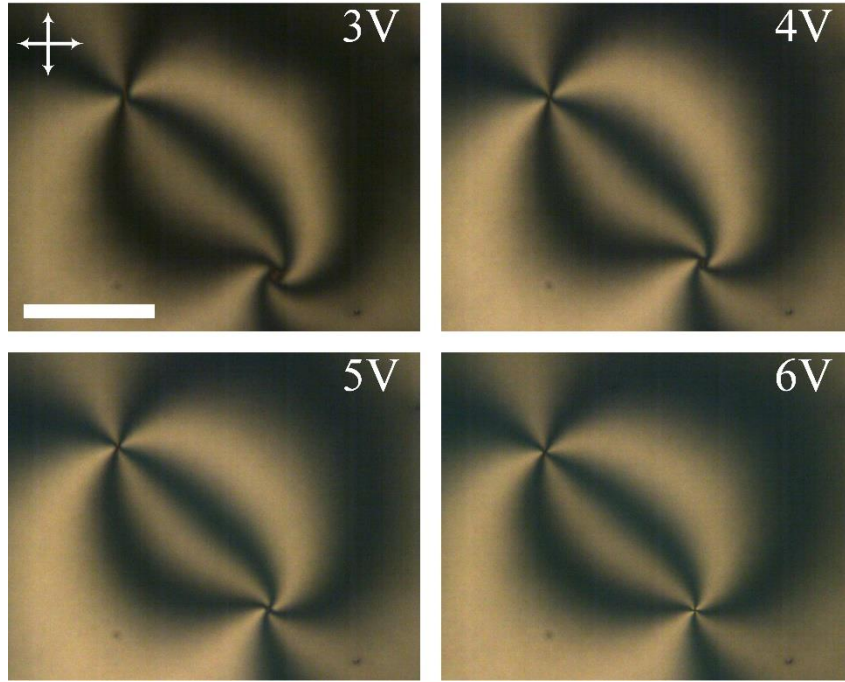


Fig. S6 POM image of a pair of umbilic defects at varied voltages. Demonstration of the size variation of defect cores with increasing voltage. $f = 100$ Hz. Scale bar $100\ \mu\text{m}$. The crossed white arrows represent the polarizers.

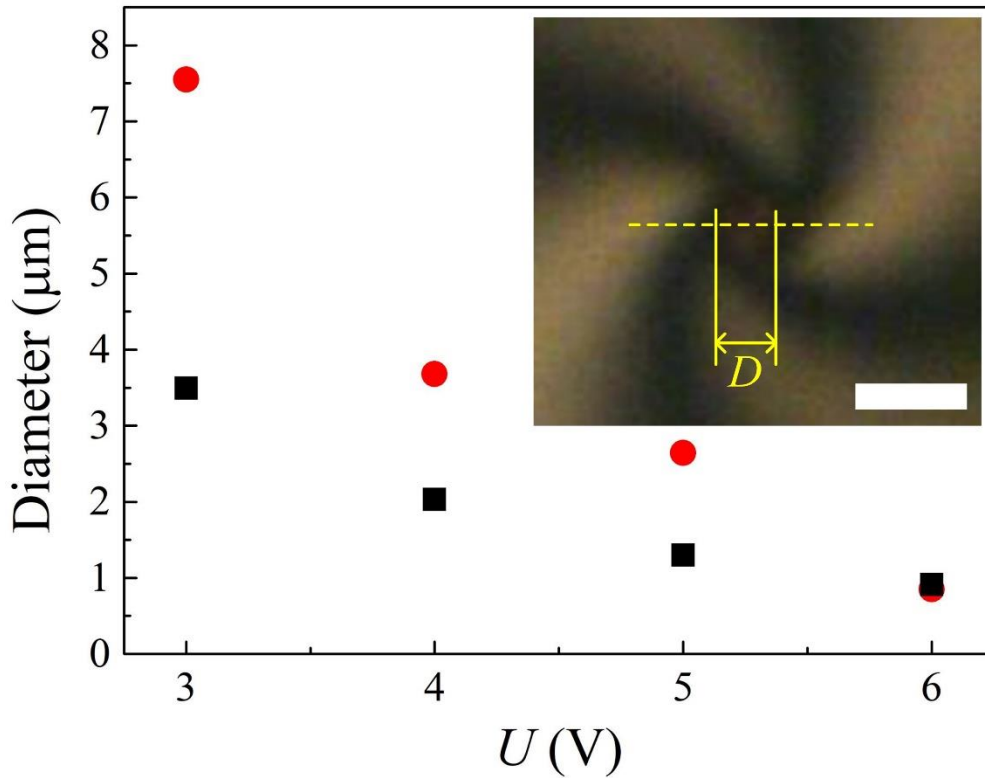


Fig. S7 The voltage dependence of the diameter (D) of the umbilic defect core. The red circles represent the $s = +1$ defects and the back squares represent the $s = -1$ defects. The inset shows the POM images of an umbilic defect. The diameter is measured as the width of the cross-section of the defect core as indicated by the yellow lines. Scale bar $10\ \mu\text{m}$.

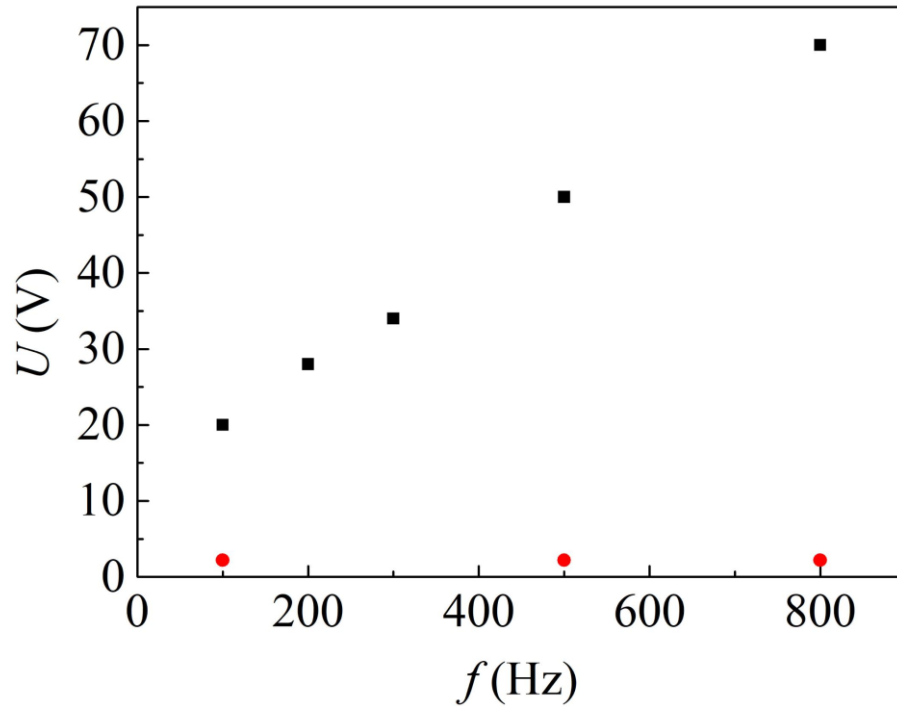


Fig. S8 Frequency dependence of voltage thresholds of directrons. Voltage thresholds of directrons (black squares) and Fredericksz transition (red circles) in cells of homeotropic alignment ($p \sim 10 \mu\text{m}$, $d \sim 9.4 \mu\text{m}$).