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Defect dynamics of the 2D confined active nematic liquid crystals.[1] ACHINI OPATHALAGE, MICHAEL NORTON, MICHAEL JUNIPER[2], SETH FRADEN, ZVONIMIR DOGIC, Brandeis Univ — We study the role of boundary conditions on a simplified experimental model of biological active matter system composed of extensile filamentous bundles of microtubules driven by clusters of kinesin motors, to elucidate the structure and dynamics of active nematic liquid crystals. These bundles form a dense quasi-2D active nematic liquid crystals when sediment onto a surfactant-stabilized oil-water interface. We further confine this system onto different boundary conditions, imposing total topological charge and obstructing the natural length scales of the bundles. We observe unique dynamical behavior under high confinement in the order of hundred micrometers. The system produces two circulating +/- 1/2 defects, drive the material toward the edge of the circle. The circulating behavior is eventually destroyed by buckling of the nematic at the container wall which nucleates a +/- defect pair. This behavior is remarkably periodic until the energy supply of the system; ATP is drained. We also study the defect-defect and defect-boundary in the confinement of annuli for a range of inner diameters and widths.

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