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Dynamical axion string, screw dislocation in Weyl semimetals and Axion insulators YI-ZHI YOU, University of California, Santa Barbara, GIL YOUNG CHO, Korea Advanced Institute of Science and Technology, TAYLOR HUGHES, University of Illinois Urbana- Champaign — We study the interplay between the geometry and axion string resulting from a chiral symmetry breaking in 3D. The chiral symmetry is spontaneously broken by charge density wave (CDW) order parameter nesting two Weyl points, which turns it into an axion insulator. The phase fluctuation of the CDW order parameter acts as a dynamical axion field coupled to electromagnetic field via $\theta F \wedge F$ term. When the axion insulator is coupled with the background geometry with torsional defects, i.e. screw dislocations, there is a novel interplay between the dislocation and the dynamical axion string. First, we show that the screw dislocation traps an axial charge. This then implies that if an axion string braids with a parallel screw dislocation, there is Berry phase accumulated during the braiding procedure. In addition, the cubic coupling between the axial current and the torsion bilinear shows the Berry phase accumulated by the three-loop braiding procedure, where we braid one dislocation loop around the other dislocation loop where the both are linked by an axion string loop. We also observe a chiral magnetic effect induced by a screw dislocation in the absence of chemical potential imbalance between Weyl points.

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