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"Alive" Berry Curvature and Emergent Maxwell Dynamics: New Pairing Mechanism in Antiferromagnets RAN CHENG, University of Texas at Austin, YIZHUANG YOU, Tsinghua University, BIAO WU, Institute of Physics, CAS, QIAN NIU, University of Texas at Austin — A covariant Berry curvature in Antiferromagnetic (AFM) system is formulated, which is a Wess-Zumino term in analogous to that in ferromagnetic system. Due to band degeneracy, this curvature is in general non-Abelian. However, it reduces to an Abelian field $F_{\mu\nu}$ when the coupling strength is strong. In disordered region with local Neel order, this curvature becomes "alive" by obtaining a $F_{\mu\nu}^2$ kinetic term, yielding a full set of Maxwell equations. A significant prediction is given: a pair of electrons with opposite spins are attractive by exchanging the "photons" of the Berry curvature in a $1/r$ Coulomb's law in 2-D disordered AFM, thus creating a bound state of the entire system, which provides a new possible paring mechanism of High-Tc superconductivity.

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