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Weyl Semimetal in the Limit of Strong Coulomb Interactions AKIHIKO SEKINE, KENTARO NOMURA, Institute for Materials Research, Tohoku University — Weyl semimetals have a topological property such that an energy gap opens only if the Weyl nodes with opposite chirality meet and annihilate each other. Then it is expected that Weyl semimetals are stable against perturbations. Motivated by this, we study the stability of a time-reversal symmetry broken Weyl semimetal with two nodes against strong $1/r$ long-range Coulomb interactions. We consider the case where magnetic impurities are doped into a 3D topological insulator, and take into account the $1/r$ Coulomb interactions between the bulk electrons. In this case, the system can be described by the U(1) lattice gauge theory. With the use of the strong coupling expansion of the lattice gauge theory and the mean-field approximation, we analyze the system from the strong coupling limit. It is shown that parity (spatial inversion) symmetry of the system is spontaneously broken in the strong coupling limit, and a different type of the Weyl semimetal, in which time-reversal and parity symmetries are broken, appears in the strong coupling limit.

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