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Quantum theory of multiferroics in quasi-one-dimensional spin-1/2 frustrated magnets[1] SHIGEKI ONODA, MASAHIRO SATO, RIKEN (Institute of Physical and Chemical Research), Wako 351-0198, Japan, YASUHIRO SAIGA, Department of Physics, Nagoya University, Nagoya 464-8602, Japan, SHUNSUKE FURUKAWA, RIKEN (Institute of Physical and Chemical Research), Wako 351-0198, Japan — A theory is developed to understand recent experimental findings on quasi-one-dimensional spin-1/2 multiferroics $LiCuVO_4$ and $LiCu_2O_2$. For this purpose, weakly coupled frustrated quantum spin chains with and without the zigzag structure are studied by means of an effective field theory based on the bosonization in one dimension. A chiral ground state with gapless incommensurate spin excitations can be stabilized in the presence of an easy-plane anisotropy. This state is driven by a three-dimensional coupling to the incommensurate helimagnetic state, in accordance with the experimental observations. We also reveal the quantum dynamics of the spin, the chirality and the electromagnon as well as the finite-temperature phase diagram, which reflect the one-dimensional nature of the quantum fluctuations.

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