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Symmetry and Bulk-Edge Correspondence in the Dimerized Spin-1/2 Heisenberg Ladder with External Magnetic Field TOSHIKAZE KARIYADO, YASUHIRO HATSUGAI, University of Tsukuba — The dimerized spin-1/2 Heisenberg ladder is topologically characterized from the viewpoints of symmetry protection and bulk-edge correspondence. Our focus is on the plateau phase at the half of the saturation induced by dimerization and magnetic field. The Berry phase associated with the twisted boundary condition is employed as a topological order parameter. The magnetic field reduces the symmetry of the system, but there is a topological phase protected by a spatial inversion symmetry that is characterized by a Berry phase quantized to $0/\pi$. For a Berry phase quantization, usage of a symmetry-preserving boundary, which leaves at least one inversion center after the system is cut at the boundary, is essential. As a comparison, a symmetry-breaking boundary is also analyzed. Naively, such a boundary is inadequate to make the Berry phase quantized and topological. However, for a specific type of boundary, we found a unique quantization of the Berry phase into $\pm\pi/2$, instead of $0/\pi$ [T. Kariyado and Y. Hatsugai, Phys. Rev. B 90, 085132 (2014)]. Further, for the case of $\pm\pi/2$-quantization, there appears an edge state distinct from the one for the $0/\pi$-quantization, which reveals new aspects of the bulk-edge correspondence for symmetry-breaking boundary.

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