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Determination of Boundary Scattering, Intermagnon Scattering, and the Haldane Gap in Heisenberg Chains¹ HIROSHI UEDA, KOICHI KUSAKABE, Graduate School of Engineering Science, Osaka University — Low-lying magnon dispersion in a $S = 1$ Heisenberg antiferromagnetic (AF) chain with boundary $S/2$ spins coupling antiferromagnetically ($J_{\text{end}} > 0$) is analyzed by use of the non-Abelian DMRG method. The Haldane gap Δ , the magnon velocity v , the inter-magnon scattering length a , and the scattering length a_b of the boundary coupling are evaluated. The length a_b , which represents the contribution of boundary effects, depends on J_{end} drastically, while Δ , v , and a are constant irrespective of J_{end} . Our method estimates the gap of the $S = 2$ AF chain as $\Delta = 0.0891623(9)$ using a chain length up to 2048, which is longer than the correlation length.

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