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Excitation structure of frustrated spin chains with dimerization and the description by the effective field theory[1] SHINTARO TAKAYOSHI, MASAKI OSHIKAWA, Institute for Solid State Physics, University of Tokyo — Heisenberg antiferromagnetic chain with alternating exchange interaction is an important model, which describes magnetic properties of real materials. Field theoretical approach is a powerful tool to investigate such kind of one-dimensional quantum magnets, and it is known that this lattice model is related with corresponding sine-Gordon effective field theory through the bosonization technique. We investigate the excitation spectrum and the correspondence between $S = \frac{1}{2}$ and 1 frustrated chain with dimerization and their effective field theories by both analytical and numerical methods, focusing on the mass ratio r of second breather to soliton. In the result, the $S = \frac{1}{2}$ and 1 cases are understood in a unified way. r becomes $\sqrt{3}$, the value predicted from sine-Gordon model by the introduction of next-nearest neighbor coupling $J_2 = J_{2c}$ where the marginal term in effective field theory vanishes. The universality class of transition is Tomonaga-Luttinger liquid and first order for $J_2 < J_{2c}$ and $J_2 < J_{2c}$, respectively. We also consider the effect of the marginal term on r quantitatively by using form factor perturbation theory and renormalization analysis.

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