

Galois symmetry of energy levels of the XXX model for the case of octagonal two-magnon states on the generic star of quasimomentum

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We consider the factor v of the characteristic polynomial $w^H(x)$ of the Heisenberg Hamiltonian \hat{H} of the XXX model, corresponding to the generic star $\{k = \pm 1, \pm 3\}$ of quasimomentum k for octagonal ($N = 8$) magnetic ring in the two-magnon sector. This factor is recognized as the fourth degree polynomial with integer coefficients, indecomposable over the prime number field \mathbb{Q} of rationals. We demonstrate the physical meaning of the corresponding Galois group as the group of permutations of eigenenergies between the quasimomenta entering the generic star of the Brillouin zone of octagon. In particular, we point out the role of intersection of this group with Galois group of the cyclotomic field, responsible for the translational symmetry of octagon. Bound and scattered two-magnon eigenstates are identified by their spectra.