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Exactly solvable subspaces of spin-1 chains with boundaries and quasiparticle interactions

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We propose a new family of non-integrable spin-1 chains with exactly solvable subspace. Based on the idea of the tower of quasiparticle excitations, a series of non-integrable Hamiltonians with exactly solvable subspace and the associated exactly solvable energy eigenstates is constructed. The obtained exactly solvable energy eigenstates are the candidates of quantum many-body scar states, since they are equipped with entanglement entropies which are expected to behave as the sub-volume law. Generalizations to the non-trivial boundary and quasiparticle interacting cases has been achieved by removing the frustration-free condition and the local orthogonality condition from the original construction of the tower of quasiparticle states. We found that the equally spaced energy spectrum structure is not violated by the diagonal boundaries. We also found that there exists the non-integrable spin-1 chain with the energy spectrum in which the spectrum of the spin-1/2 XXX model is embedded.

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