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Spin-soliton excitations from the Bond-Charge-Density Wave spin-Peierls state in the $\frac{1}{4}$-filled band[1] R.T. CLAY, R.P. HARDIKAR, Mississippi State University, S. MAZUMDAR, University of Arizona — The spin-Peierls (SP) transition is commonly discussed in the context of the $\frac{1}{2}$-filled band where the SP state is bond-dimerized. Spin excitations from the SP state generate spin solitons in pairs with opposite-phased bond alternation in between the solitons. As thermal excitations generate additional solitons, oppositely-phased regions overlap and ultimately give way to the uniform phase. Throughout the process the charges on the sites remain uniform. This simple description has to break down in $\frac{1}{4}$-filled band systems where the SP state is a Bond-Charge-Density Wave (BCDW) state with coexisting bond and charge-tetramerization. At $\frac{1}{4}$-filling spin excitations are necessarily accompanied by changes in site charges. We prove the highly interesting result that site charges here can change locally in two different ways, leading to two different kinds of spin solitons. Which kind of soliton dominates is parameter-dependent. The two kinds of solitons promote two different high temperature states, which are either bond-dimerized or charge-dimerized. We discuss experimental consequences of our work.

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