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Strong-randomness phenomena in quantum Ashkin-Teller models[1] THOMAS VOJTA, HATEM BARGHATHI, FAWAZ HRAHSHEH, Missouri Univ of Sci & Tech, JOSE HOYOS, Instituto de Fisica de Sao Carlos, Universidade de Sao Paulo, RAJ NARAYANAN, Indian Institute of Technology Madras — The N-color quantum Ashkin-Teller spin chain is a prototypical model for the study of strong-randomness phenomena at first-order and continuous quantum phase transitions. This talk discusses strong-disorder renormalization group approaches to this system in the weak-coupling as well as the strong-coupling regimes. Specifically, we introduce a novel general variable transformation that unifies the treatment of the strong-coupling regime. This allows us to determine the phase diagram for all color numbers N, and the critical behavior for all $N \neq 4$. In the case of two colors, $N = 2$, a partially ordered product phase separates the paramagnetic and ferromagnetic phases in the strong-coupling regime. This phase is absent for all $N > 2$, i.e., there is a direct phase boundary between the paramagnetic and ferromagnetic phases. In agreement with the quantum version of the Aizenman-Wehr theorem, all phase transitions are continuous, even if their clean counterparts are of first order. We also discuss the various critical and multicritical points. They are all of infinite-randomness type, but depending on the coupling strength, they belong to different universality classes.

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