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Accurate determination of the Gaussian transition in spin-1 chains with single-ion anisotropy BRUCE NORMAND, SHIJIE HU, XIAO-QUN WANG, Department of Physics, Renmin University of China, Beijing 100872, China, LU YU, Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China — The Gaussian transition in the spin-one Heisenberg chain with single-ion anisotropy is extremely difficult to treat, both analytically and numerically. We introduce an improved DMRG procedure with strict error control, which we use to access very large systems. By considering the bulk entropy, we determine the Gaussian transition point to 4-digit accuracy, $D_c/J = 0.96845(8)$, resolving a long-standing debate in quantum magnetism. With this value, we obtain high-precision data for the critical behavior of quantities including the ground-state energy, gap, and transverse string-order parameter, and for the critical exponent, $\nu = 1.472(2)$. Applying our improved technique at $J_z = 0.5$ highlights essential differences in critical behavior along the Gaussian transition line.

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