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UNIVERSALITY OF THE ISING AND S=1 MODEL ON ARCHIMEDEAN LATTICES : AN ACCURATE MONTE CARLO DETERMINATION

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The Ising model S = 1/2 and the S = 1 model are studied by efficient Monte Carlo schemes on the (3, 4, 6, 4) and the (3, 3, 3, 3, 6) Archimedean lattices. The algorithms used, a hybrid Metropolis-Wolff algorithm and a parallel tempering protocol, are briefly described and compared with the simple Metropolis algorithm. . Accurate Monte Carlo data are produced at the exact critical temperatures of the Ising model for these lattices. Their finite-size analysis provide, with high accuracy, all critical exponents which, as expected, are the same with the well known 2d Ising model exact values. A detailed finite-size scaling analysis of our Monte Carlo data for the S = 1 model on the same lattices provides very clear evidence that this model obeys, also very well, the 2d Ising model critical exponents. As a result, we find that recent Monte Carlo simulations and attempts to define effective dimensionality for the S = 1 model on these lattices are misleading. Accurate estimates are obtained for the critical amplitudes of the logarithmic expansions of the specific heat for both models on the two Archimedean lattices.