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A study of $N=2$ Landau-Ginzburg model by lattice simulation based on a Nicolai map

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It is conjectured that the two-dimensional $N=2$ Wess-Zumino model with a quasi-homogeneous superpotential provides a Landau-Ginzburg description of the $N=2$ superconformal minimal models. For the simplest cubic superpotential $W = \lambda \Phi^3 / 3$, it is expected that the Wess-Zumino model describes A_2 model and the chiral superfield Φ shows the conformal weight $(h, \bar{h}) = (1/6, 1/6)$ at the IR fixed point. We will examine this conjecture by a lattice simulation, extracting the weight from the finite volume scaling of the susceptibility of the scalar component in Φ . We adopt a lattice model with the overlap fermion, which possesses a Nicolai map and a discrete R -symmetry. We set $\lambda = 0.3$ and sample scalar configurations by solving the Nicolai map on each $L \times L$ lattices, with $L = 18, 20, 22, 24, 26, 28, 30, 32$. To solve the map, we use the Newton-Raphson algorithm with various initial configurations. About 640 configurations are analyzed on each L , and the fermion determinants are explicitly evaluated. The result is $1-h-\bar{h} = 0.660 \pm 0.011$, which is consistent with the conjecture.

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talk

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