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11. Mathematical Physics

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Fss Properties of an Exactly Solvable Quantum Model

The scaling function of the free energy and the finite temperature C-function, as well as the "temporal" Casimir amplitudes $\Delta(d)$ of the recently proposed quantum spherical model under periodic boundary conditions and geometry $\infty^{d-1} \times T^{-1}$ are analytically derived and analyzed. We consider the case of a short-range interaction and some special cases of long-range interactions decreasing at long distances as $1/r^{d+\sigma}$ with $0 < \sigma \leq 2$. Special attention is paid on the $d = \sigma$ case where the result $\Delta(\sigma) = -16\zeta(3)/\left[5\sigma\left(4\pi\right)^{\sigma/2}\Gamma\left(\sigma/2\right)\right]$ is obtained. It is shown that the monotonicity of the C-function, as a function of the temperature, depends on the existence of a phase transition in the finite- and/or zero-temperature system.

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