On the ratio of string tensions in the 3D $Z_4$ lattice gauge theory

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In a recent study by Giudice et al [arXiv:hep-th/0703153], it was shown that the ratio between the k-string tension and the string tension of the fundamental representation is independent of the temperature up to third order. Focusing on the 3D $Z_4$ gauge model at finite temperature, we conjecture that such a ratio is actually independent of the temperature at all orders. We use the Svetitsky-Yaffe conjecture to map the gauge theory onto the Sine-Gordon model in order to give an exact estimate of such a ratio in the vicinity of the deconfining phase transition. Our conjecture implies that the latter estimate coincides with the ratio at zero temperature, and we check this prediction against high precision numerical simulations.