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On Noncompact Heterotic Nonlinear Sigma Models

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We study a heterotic two-dimensional $N=(0,2)$ gauged non-linear σ -model whose target space is a weighted complex projective space. We consider the case with N positively and $N^{\sim} = NF - N$ negatively charged fields. This model is believed to give a description of the low-energy physics of a non-Abelian semi-local vortex in a four-dimensional $N=2$ supersymmetric $U(N)$ gauge theory with $NF > N$ matter hypermultiplets. The supersymmetry in the latter theory is broken down to $N=1$ by a mass term for the adjoint fields. We solve the model in the large- N approximation and explore a two-dimensional subset of the mass parameter space for which a discrete $Z_{N-N^{\sim}}$ symmetry is preserved. Supersymmetry is generically broken, but it is preserved for special values of the masses where a new branch opens up and the model becomes super-conformal.

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