Physikalisches Institut
Universität Bonn
Theoretische Physik

Exercise 11
6. Jul 2006
SS 06

Exercises on Elementary Particle Physics II

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Final exam: Monday July, 10th 2006 from 11.15 to 13.00 in HS1 PI

1. *No-Scale Model*

   Take $N = 1$ supergravity with three chiral superfields S, T and C. The Kähler potential (with $M = 1$) is

   $$K = -\log(S + S^*) - 3\log(T + T^* - C^*C). \tag{1}$$

   The superpotential is

   $$W = C^3 + a\exp(-\alpha S) + b, \tag{2}$$

   where a and b are arbitrary complex numbers and $\alpha > 0$. These additional terms will enable us to fix $\langle S \rangle$.

   (a) Find the auxiliary fields for S, T and C and check that SUSY is broken.

   (b) Calculate the scalar potential.

   (c) What is the value of the vacuum energy? Are there flat directions (where E_{vac} is independent of the vev of a field)?

   (d) What is the gravitino mass?