Physikalisches Institut
Universität Bonn
Theoretische Physik

Exercises 8
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SS 2011

Exercises on Theoretical Particle Physics II

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Due 07.06.2011

8.1 No Scale Model (*13 credits*)

Take $\mathcal{N} = 1$ supergravity with three chiral superfields S, T and C. The Kähler potential (with $M_P = 1$) is

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

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) First, drop the fields S and C. Show that the scalar potential vanishes. Find the auxilliary fields to see that SUSY is generically broken. (*2 credits*)

(b) Find the auxiliary fields for S, T and C and check that SUSY is broken. (*3 credits*)

(c) Calculate the scalar potential. (*2 credits*)

(d) What is the value of the vacuum energy? Are there at directions (where E_{vac} is independent of the vev of a field)? (*4 credits*)

(e) What is the gravitino mass? (*2 credits*)