Non-BPS Solutions of the Noncommutative CP^1 Model in the 2+1 Dimensions

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Noncommutative field theories naturaly arise as low-energy descriptions of string theory. Non-perturbative dynamics of string theory was investigated through the study of solitons and instantons in noncommutative gauge theories. In four-dimensional Yang-Mills theory, there exist instantons even in the $U(1)$ case. Non-trivial solutions are also known in noncommutative scalar theories. The scattering of noncommutative solitons was studied in Yang-Mills theory and in scalar theories.

In lower dimensions, nonlinear sigma models exhibit many similarities with four-dimensional Yang-Mills theory. In 2+1 dimensions, nonlinear sigma models possess soliton solutions. The BPS solitons of the CP^N model were extended to a noncommutative space. The low-energy dynamics of the BPS solitons in the noncommutative CP^1 model was investigated [1].

In this talk, we consider the noncommutative CP^1 model in 2+1 dimensions [2]. In the commutative CP^N model, general static solutions are known For $N \geq 2$, there exist non-BPS solutions in addition to the BPS solutions. On the other hand, in the commutative CP^1 model no non-BPS solutions exist. We construct non-BPS solutions of the noncommutative CP^1 model and study their dynamics. These solutions represent the co-existence of solitons and anti-solitons.

References

[1] K. Furuta, T. Inami, H. Nakajima and M. Yamamoto, Phys. Lett. **B537** (2002) 165.

[2] K. Furuta, T. Inami, H. Nakajima and M. Yamamoto, JHEP **0208** (2002) 009.