

Introduction to supersymmetry

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Abstract

The Standard Model of particle physics is the most highly tested physical theory. Recently, with the discovery at LHC of a 125GeV particle which might be identified with the missing Higgs boson, it received a major experimental confirmation. Despite the great success of the Standard Model it is believed that it is an effective theory of a more fundamental theory. Indeed, there are many points which cannot be explained within this model.

There are many theories which extend the Standard Model which can partially solve some of its problems. Supersymmetry is one of those theories which have been highly studied. Supersymmetry can be seen as a symmetry between fermions and bosons.

The purpose of these lectures is to provide the basis of supersymmetry and its application in particle physics. Throughout these lectures we will mainly stress on ideas and technical details will be left to the attendees through many solved exercises [1].

In the first part some important results on Special Relativity, in particular for the description of elementary particles, will be given. We will further show that interactions between elementary particles can be efficiently described within Gauge Invariance. In the second part of the lecture we will briefly show how space-time symmetries can be extended to supersymmetry. The third part will be devoted to the introduction of supersymmetry in field theory. In particular, we will stress the Wess-Zumino model (relevant for the description of matter) and supersymmetric electrodynamics. Finally we will show how supersymmetry can be implemented in particles physics and will conclude by some phenomenological considerations.

It is important to emphasize that depending on the requirements of the audience it will be possible to stress some specific points of the above mentioned programme and even to discuss some points not planned ahead.

The lectures will take place IPHC, 23 rue du Loess, 67037 Strasbourg in

Amphi Grunwald, Bât 25:

25, 27 of March and 10, 17 of April.

the “Salle de réunion” Bât 27, second floor:

1, 3, 8, 15 of April.

All lectures are from 4 p.m to 6 p.m.

References

- [1] B. Fuks and M. Rausch de Traubenberg, *Supersymétrie : exercices avec solutions*, Ellipses (2011), <http://editions-ellipses.fr/supersymetrie-exercices-avec-solutions-p-7697.html>.

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