PROCEEDINGS OF SCIENCE

# Propaedeutical Course on Extra Dimensions

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A pedagogical course on Extra Dimensions has been given. Given the format of this course, which served only as a background for the regular courses at the School, only the topics discussed and references will be given.

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[†]A footnote may follow.

 

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## 1. Summary of the course

- **First Lecture**: General introduction on Extra Dimensions and their meaning as effective non-renormalizable theories. Examples of simple Kaluza–Klein reductions on a circle: scalar field. Gauge field case and analogies with spontaneously broken gauge symmetries in four dimensions. Gravity case, the radion field and study of the five dimensional reparametrization symmetries left invariant by the compactification and their relation with four dimensional local symmetries.

- **Second Lecture**: Brane fields and brane dynamics, the "branons". "Explanation" of the hierarchy between the Planck and the electroweak scale by means of Large Extra Dimensions. The Randall-Sundrum model: analysis of the Einstein equations of motion and their solutions. Solution of the hierarchy problem as a red-shift with a localized Higgs field.

- **Third Lecture**: Compactification on a segment. Generation of chirality and symmetry breaking by boundary conditions on the segment (orbifold symmetry breaking). Symmetry breaking by twisted periodicity conditions (Scherk-Schwarz like symmetry breaking) and its relation to Wilson line symmetry breaking.

## References

[1] C. Csaki, "TASI lectures on extra dimensions and branes," arXiv:hep-ph/0404096.

[2] R. Rattazzi, "Cargese lectures on extra dimensions," arXiv:hep-ph/0607055.