

Advanced aspects of symmetries

Cours : Dimitrios Tsimpis (iP2i) tsimpis@ipnl.in2p3.fr

TD : Camille Eloy (ENS) camille.elay@ens-lyon.fr

Pré-requis recommandés :

Symétries et Groupes, Tenseurs et géométrie, Théorie classique des champs,
Quantification des champs libres, Interacting Quantum Fields

Course outline

I. Conformal Symmetries

We first develop conformal field theory in general spacetime dimension d : conformal transformations, the conformal algebra, quasi-primary fields, correlation functions and Ward identities.

We then specialize to two-dimensional CFT : holomorphic and antiholomorphic symmetries, the global conformal group, the Witt and Virasoro algebras, the stress tensor OPE, central charge, the free boson and basic conformal blocks / correlation functions.

II. Supersymmetry

Supersymmetric oscillator, Bose–Fermi pairing and graded superalgebras.

Two-component spinors and the four-dimensional super-Poincaré algebra.

Massive and massless multiplets, supersymmetry transformations and invariant Lagrangians.

Superspace, chiral and vector superfields, supersymmetric gauge theories.

Clifford algebras, spinors in arbitrary dimensions, reality conditions and Fierz identities.