

Lecture course

HYPERSYMMETRY

1 INTRODUCTORY LECTURE: THE AIMS AND CONTENT OF THE COURSE

BLOCK I: FIELD-CHARGES

2 MASS

- 2.1 Equivalence vs identity
- 2.2 Examples of the distinction between identity and equivalence
- 2.3 Equivalence does not mean identity
- 2.4 The equivalence principle
- 2.5 Transformation properties of gravitational and inertial masses
- 2.6 The role of masses in the stress-energy tensor of GTR
- 2.7 Conservation of mass
- 2.8 Some preliminary consequences of the distinction between masses of gravity and inertia

3 ELECTRIC CHARGE

- 3.1 Distinction between electric charges
- 3.2 Sources of the electromagnetic field
- 3.3 Equivalence principle for electric charges
- 3.4 Transformation of the two types of electromagnetic charges
- 3.5 Some preliminary consequences of the distinction between field charges of the electromagnetic field

BLOCK II: ISOTOPIC FIELD-CHARGES (IFC)

4 ISOTOPIC FIELD-CHARGES

- 4.1 Field-sources in the Standard Model (SM)
- 4.2 Isotopic field-charges
- 4.3 The identity-equivalence diversity on the example of the isotopic spin
- 4.4 3+1 quantities in physics

5 HYPERSYMMETRY (HySy)

- 5.1 Matrix algebra for 3+1 parametric transformations
- 5.2 The algebra of hypersymmetry
- 5.3 Comparing the algebra of HySy and the Dirac algebra

6 VELOCITY DEPENDENCE IN PHYSICS

- 6.1 Velocity dependent phenomena
- 6.2 Velocity dependent fields
- 6.3 Velocity dependence in the light of conservation laws and symmetries

BLOCK III: THE ISOTOPIC FIELD-CHARGE SPIN (IFCS)

7 CONSERVATION LAWS AND HYPERSYMMETRY

- 7.1 Preliminary assumptions
- 7.2 Introduction to the mathematics of the two simultaneous Noether currents in HySy
- 7.3 Noether's currents for gauge invariance localised in a velocity field
- 7.4 Discussion of the mathematical results
- 7.5 Physical considerations

8 CONSERVATION OF THE ISOTOPIC FIELD-CHARGE SPIN

- 8.1 First conserved quantity: Conservation of the field-charge (IFC)
- 8.2 Second conserved quantity: Conservation of the isotopic field-charge spin (IFCS)
- 8.3 Coupling of the two conserved quantities (IFC and IFCS)
- 8.4 Interpretation of the isotopic field-charge spin

9 ISOTOPIC FIELD-CHARGES IN FUNDAMENTAL INTERACTIONS

- 9.1 Isotopic field charges in strong and electroweak interactions
- 9.2 Summary: Field-charges in all the four fundamental interactions
- 9.3 Quanta of the velocity-dependent field

BLOCK IV: INTERACTION BETWEEN ISOTOPIC FIELD-CHARGES

10 ISOTOPIC FIELD CHARGES IN INTERACTION

- 10.1 Mechanism of the interaction between isotopic field-charges
- 10.2 Interpretation of the isotopic field-charge spin conservation
- 10.3 Mass of dions that mediate HySy transformations

11 IFC INTERACTIONS COUPLED WITH THE SM FIELDS

- 11.1 Mechanism of commuting IFCS
- 11.2 Hypersymmetry applied to gravitational interaction
- 11.3 Hypersymmetry applied to electromagnetic interaction
- 11.4 Mechanism of the IFCS exchange in weak interactions
- 11.5 Mechanism of the IFCS exchange in strong interactions

12 CLOSING, SUMMARY LECTURE

- 12.1 The birth and childhood of IFC hypersymmetry
- 12.2 Summary of the findings in the HySy model
- 12.3 Hypersymmetry and our picture of the physical world
- 12.4 Closing remarks