Acta Physica Hungarica 73 (1), pp. 51-58 (1993)

A SUPERSPACE ORIGIN FOR AN EXTENDED GAUGE MODEL

C. M. DORIA, R. M. DORIA* and F. A. B. RABELO DE CARVALHO**

University of Warwick, Mathematics Institute
CV7 4A2 Coventry, England
**Universidade Federal do Rio de Janeiro*
Ilha do Foundão, Rio de Janeiro, Brasil
***Universidade Católica de Petrópolis (UCP)*
25600 Petrópolis, RJ, Brasil

(Received 12 January 1993)

Supersymmetry provides an example of Gauge Theories where the presence of more than one gauge potential in the same group naturally emerges. Particularly, we study the Abelian case in three dimensions. A dynamics accounting for the presence of only two potential fields in a single group is obtained via a soft-breaking of supersymmetry.

1. Introduction

Symmetry environment should not be restricted to the simple fusion between Group Theory and Quantum Theory. The existence of a symmetry can be developed in a space larger than the limit where the number of potential fields rotating under the same group equals the number of generators of the group. This context motivates us to make the statement that a gauge group also rules a Gauge Theory where N-families of potential fields are transforming as

$$\begin{aligned} A_\mu &\to UA_\mu U^{-1} + \frac{i}{g}\partial_\mu U \cdot U^{-1}, \\ B_\mu &\to UB_\mu U^{-1} + \frac{i}{g}\partial_\mu U \cdot U^{-1}, \\ &\vdots \qquad\quad \vdots \\ N_\mu &\to UN_\mu U^{-1} + \frac{i}{g}\partial_\mu U \cdot U^{-1}. \end{aligned} \tag{1}$$

However, such an affirmation (1) cannot be tested experimentally. This is so because a field cannot be directly measured. Therefore, it is not possible to think of experimental models that would distinguish the fields A_μ, B_μ, etc.

Considering such a limitation that field theory offers for laboratory to test (1), we move to the theoretical approach in order to get some reasons to justify the opinion (1). Gradually, different insights have been developed to identify these