Change of Electroweak Nuclear Reaction Rates by CP- and Isospin Symmetry Breaking – A Model Calculation

Harald Stumpf

Institute of Theoretical Physics, University Tübingen, Auf der Morgenstelle 14, D-72076 Tübingen, Germany

Reprint requests to Prof. H. S.; E-mail: herold@tat.physik.uni-tuebingen.de

Z. Naturforsch. **61a,** 439 – 456 (2006); received July 14, 2006

Based on the assumption that electroweak bosons, leptons and quarks possess a substructure of elementary fermionic constituents, in previous papers the effect of CP-symmetry breaking on the effective dynamics of these particles was calculated. Motivated by the phenomenological procedure in this paper, isospin symmetry breaking will be added and the physical consequences of these calculations will be discussed. The dynamical law of the fermionic constituents is given by a relativistically invariant nonlinear spinor field equation with local interaction, canonical quantization, selfregularization and probability interpretation. The corresponding effective dynamics is derived by algebraic weak mapping theorems. In contrast to the commonly applied modifications of the quark mass matrices, CP-symmetry breaking is introduced into this algebraic formalism by an inequivalent vacuum with respect to the CP-invariant case, represented by a modified spinor field propagator. This leads to an extension of the standard model as effective theory which contains besides the "electric" electroweak bosons additional "magnetic" electroweak bosons and corresponding interactions. If furthermore the isospin invariance of the propagator is broken too, it will be demonstrated in detail that in combination with CP-symmetry breaking this induces a considerable modification of electroweak nuclear reaction rates.

Key words: Nuclear Reaction Rates; Electroweak Processes; Symmetry Breaking.