

21 世紀 COE セミナー

日時 : 2007 年 2 月 2 日(金) 16:00~

場所 : 大阪大学核物理研究センター・4 階 Lecture room

題目 : UA(1) symmetry and nucleon parity doubling

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要旨 :

We examine the role of $U_{A}(1)$ symmetry and its breaking in a quartet of the nucleon, Roper and their odd parity resonances. Firstly we show that the $U_{A}(1)$ transformations connect two independent interpolating fields in the form of quark trilinears. They form two irreducible representations of $U_{A}(1)$ symmetry, one "mirror" and another "naive", the latter with triple axial baryon charge. We also examine their $SU_{L}(2) \times SU_{R}(2)$ transformations of these fields and show that for each local nucleon field there is one with a derivative in the "mirror" representation. Thence we construct the most general non-derivative effective interaction consisting of these four nucleon fields in the good $U_{A}(1)$ and $SU(2)_{L} \times SU(2)_{R}$ symmetry limit.

After spontaneous breaking down to $SU(2)_{V}$, we show that the mass splittings induced by this effective interaction can reproduce all masses of the four nucleon states, if physical states are suitably identified.

We try and use the experimental nucleon resonance decay data to fix other free parameters.