Z_2 AS THE TOPOLOGICAL ORIGIN OF $(B+L)$ VIOLATION IN THE HOT ELECTROWEAK THEORY

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The space of static finite-energy configurations in the electroweak theory admits a $\mathbf{Z}_2$ topological structure. More precisely, we show that this space contains two disconnected sectors of unstable gauge-Higgs fields odd under a properly defined generalized parity. This classification extends the description of baryon and lepton number violating electroweak processes to the symmetric phase of the theory. Configurations with odd pure-gauge behaviour at spatial infinity, such as the sphaleron, multisphalerons, electroweak strings as well as an infinite surface of their equivalents, have half-integer Chern-Simons number and mediate $B+L$ violating processes in the early universe. Finite-energy configurations with even pure-gauge behaviour, such as the S^* new sphaleron and electroweak strings, are topologically equivalent to the vacuum and are irrelevant for $B+L$ violation. We discuss the possible formation of $B+L$ violating quark-lepton condensates in the symmetric high-temperature phase of the electroweak theory.

REFERENCE

Exenides M., Johansen A.A., Nielsen H.B., Tornkvist O. Preprints NBI-HE-95-21, HUTP-95/A036; hep-ph/9511240. Submitted for publication in Nucl.Phys.**B**.

FORMFACTOR $\pi^0 \to \gamma^* + \gamma^*$ AT DIFFERENT PHOTON VIRTUALITIES

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The $\pi^0\gamma\gamma$ vertex for virtual photons of squared masses q_1^2 and q_2^2 plays a vital rôle in several physical processes; for example for $q_1^2 < 0$, $q_2^2 < 0$, in the two-photon physics reaction $e^+e^- \to e^+e^-\pi^0$, and for $q_1^2 > 0$, $q_2^2 > 0$, in the annihilation process $e^+e^- \to \pi^0 l^+ l^-$. It is also of interest because of its link to the axial anomaly. We have obtained a closed analytic expression for the vertex in the limit in which at least one of $|q_1^2|$ and $|q_2^2|$ is large for arbitrary fixed values of the ratio q_1^2/q_2^2. Our work thus generalizes previous results obtained for the cases $q_1^2 = q_2^2 \to -\infty$ and $q_1^2 = 0$, $q_2^2 \to \infty$. It should be straightforward to test our predictions experimentally.

REFERENCE

Anselm A.A., Johansen A.A., Leader E., Lukasuk L. Preprint HUTP–95/A037. Submitted for publication in Nucl.Phys., **B**.