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T and C symmetry breaking in Algebraic Quantum Field Theory †

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Abstract: We developed a quantum field theory of spinors based on the algebra of canonical anti-commutation relations (CAR algebra). The proposed approach is based on the use of Grassmann densities in the momentum space and derivatives with respect to them and the construction from these densities of both basis Clifford vectors of spacetime and spinor vacuum. We have shown the existence of two vacua, normal and alternative. We have proved that CPT is the real structure operator in the theory of Krein spaces. C and T operators transform a normal vacuum into an alternative one, which leads to the breaking of these symmetries.

Keywords: CAR algebra; Clifford algebra; Krein spaces; discrete symmetries; Dirac sea; time reversal; charge conjugation; CPT theorem; CTP theorem

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