

DOES THERE EXIST AN
INERTIAL REFERENCE FRAME FOR ROTATION?

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Abstract: I have discovered a singular solution of the momentum space Dirac equation in the massless (conformal symmetric) case. This state is a pure s-state (no orbital angular momentum) and therefore is completely at rest with respect to rotation. Hence, it represents an inertial reference frame for rotation.

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A research article [1] by me concerning the theory of the massless (Weyl) neutrino examined quantum states and associated operators in momentum space for this ultra-relativistic particle. The total angular momentum of the momentum eigenstates consists of orbital and spin components where the orbital component can be shown mathematically to be identically zero (an s-state).

This means that the total angular momentum is identical with the (internal) spin momentum. The vanishing of the orbital angular momentum means that this particle is non-rotating in three dimensional space and hence represents a non-rotating (inertial) reference frame.

The question remains whether the Weyl neutrino represents a physical state or whether it is an unreachable limit like the absolute zero of temperature. I will not discuss this question here, since it relates to difficult concepts regarding the curvature (or non-curvature) of space-time. However, it is useful to note that

apparently the momentum and coordinate representations of this limiting case are not equivalent mathematically, since it is clear that in coordinate space of the Dirac equation we have a plane wave which contains a sum over all integer values of angular momentum.

References

- [1] S.B. Berger, Conformal symmetry in the Weyl theory, *Lettere al Nuovo Cimento*, **11** (1974), 89-91.