

Statistical mechanics and thermodynamics of rotating continuous helicity gas

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We consider the statistical mechanics and thermodynamics of a rotating ideal gas of classical continuous helicity particles travelling in three-dimensional Minkowski space. By constructing a phase-space and determining an invariant measure on it, we obtain a one-particle distribution function for the system with constant temperature and angular velocity. We show that macroscopic rotation causes an anisotropy of momenta distribution. This indicates the presence of chiral effects. We also discover partial non-rotation of gas meaning that only one direction of two-dimensional rotation takes place for such gas. Thermodynamics analysis has shown non-monotonous dependence of angular momentum on angular velocity. Phase transition was discovered with small values of angular velocity.

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