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Dynamics and wave phenomena in Relativistic magnetohydrodynamics

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The dynamics of the hot and dense quark-gluon plasma(QGP) formed in high energy heavy ion collisions is well described by the Relativistic viscous hydrodynamics formalism. In the initial stages of heavy-ion collisions, a strong transient magnetic field (10^14- 10^15 T) is also produced primarily due to the spectator protons. The dynamics of electrically conducting QGP under the intense electromagnetic field are expected to be described by the Relativistic magnetohydrodynamics formalism (RMHD). Also, any relativistic theory should preserve causality, i.e., superluminal signal propagations in fluids are strictly prohibited. In this talk, we will discuss the evolution of dissipative stresses in the presence of an external magnetic field where signal propagations are causal. The causal relativistic magnetohydrodynamics theory was derived using the kinetic theory in RTA (relaxation time) approximation. Also, we will briefly discuss various modes of wave propagation and the allowed parameter space for causality to hold in curved space-time.

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