Scuola Superiore di Catania

Corso Specialistico
Classe delle Scienze Sperimentali
Ambito Scienze e Tecnologie
a.a. 2021-2022

Fluidodinamica quanto-relativistica e le sue applicazioni

Quantum Relativistic Fluid Dynamics and its applications

Introduction to fluid dynamics in relativistic and non-relativistic regime.
Transport coefficients in linear response theory: shear viscosity, bulk viscosity, heat conductivity, electric conductivity.
Viscous hydrodynamics in relativistic regime.
Causality and necessity to go to II order in relativistic fluid: Israel-Stewart expansion.
Application to quark-gluon plasma and cold atomic matter.
General-relativistic hydrodynamics and application to viscous black-hole accretion.
Density operator approach to the physics of fluid dynamics.
Concept of thermal equilibrium for spin degrees of freedom.
Thermal vorticity. Phenomena of local and global polarization in relativistic regime.
Link of hydrodynamics with spin and general relativity.
Belinfante-Rosenfled stress tensor.
Relativistic transport theory.
Wigner approach to quantum relativistic transport equation. Transport
Application to the phenomenology of ultra-relativistic nuclear collision: pp, pA, AA.