

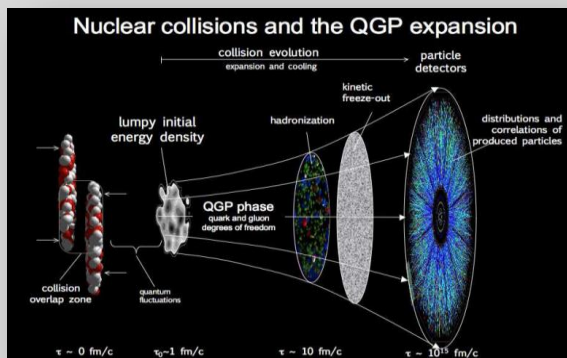
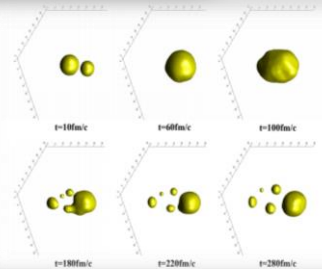
Theoretical and computational physics – research –

Modelling the interaction of light with matter (relevant for ELI-NP)

- The study of atomic systems in intense laser fields, quantum electrodynamics
- The description of laser-plasma interaction using high-performance transport models
- High performance computing, Particle-in-Cell methods, Vlasov equations
- Helicoidal light: properties, interaction with metallic clusters, plasma and atomic nuclei

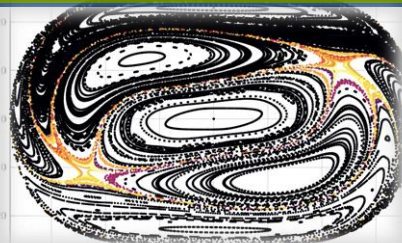
Modelling nuclear and subnuclear systems (relevant for ELI-NP, CERN and FAIR)

- Collective states in quantum systems, pigmy and giant dipole resonances at ELI-NP
- Fusion and fragmentation of atomic nuclei within non-equilibrium kinetic models
- Quark-gluon expansions, spontaneous symmetry breaking mechanisms



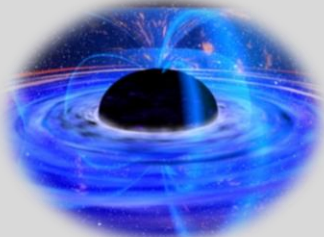
Interacting quantum systems

- Analyzing quantum correlations and quantum information
- The dynamics of ultra-cold quantum gases, their collective motion and Bose-Einstein condensates
- Pairing and clustering phenomena in mesoscopic systems; phase transitions



Cosmology and gravitations

- Modelling the dynamics of the Universe in the presence of dark matter
- Classical and relativistic fluids



Nonlinear dynamics, chaos and the physics of complex systems

- Chaos in classical and quantum systems
- Statistical properties of earthquakes
- Statistical properties of musical structures
- The phonetics of Romanian language