



University of Stuttgart
Germany



SPP 1929 – Seminar

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Universität Stuttgart
NWZ II, Raum 3.123
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Arrested relaxation in an isolated molecular ultracold plasma

Spontaneous avalanche to plasma splits the core of an ellipsoidal Rydberg gas of nitric oxide. Ambipolar expansion first quenches the electron temperature of this core plasma. Then, long-range, resonant charge transfer from ballistic ions to frozen Rydberg molecules in the wings of the ellipsoid quenches the centre-of-mass ion/Rydberg molecule velocity distribution. This sequence of steps gives rise to a remarkable mechanics of self-assembly, in which the kinetic energy of initially formed hot electrons and ions drives the separation of plasma volumes. These dynamics adiabatically sequester energy in a reservoir of mass transport, starting a process that anneals separating volumes to form an apparent glass of strongly coupled ions and electrons. Short-time electron spectroscopy provides evidence for complete ionization. The long lifetime of this system, particularly its stability with respect to recombination and neutral dissociation, suggests that this transformation affords a robust state of arrested relaxation, far from thermal equilibrium.