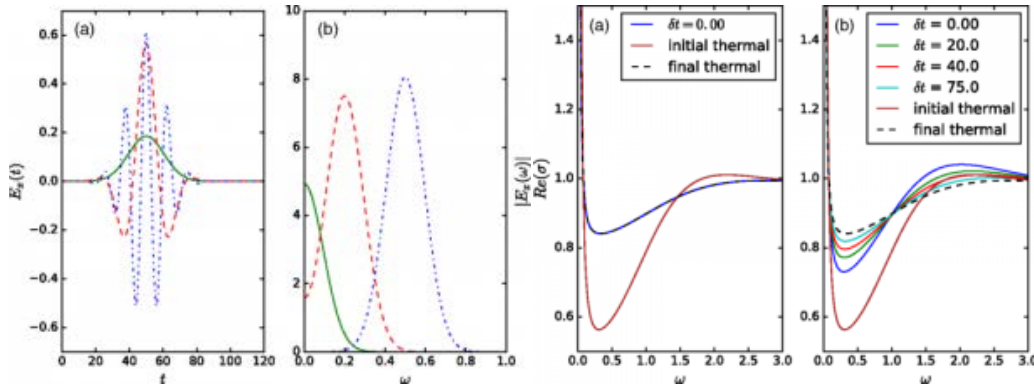


Holographic pump-probe spectroscopy: instantaneous thermalization



[Optical pump probe spectroscopy](#) is a literal realization of the Eigenstate Thermalization Hypothesis protocol. This insists that after a certain thermalization time the VEV's of local operators associated with the unitary time evolution cannot be distinguished from the results in the thermal state. But it does not specify how long it takes.

Resting on the universal Penrose diagram associated with the Vaidya type infalling shell we demonstrate that in a holographic strange metal the thermalization time shrinks to zero: the system thermalizes instantaneously, rooted in the “maximal” many body entanglement.

In the left figure the optical pump both in the time (a) and frequency domain (b). In the right figure the probe optical conductivity for the pump signal lacking the zero frequency component (blue, a) and the featureless pulse (green, b). In the latter case the thermalization is set by the momentum relaxation time: the zero frequency electrical field accelerates the whole system to a finite momentum that slowly relaxes.

This is an inspiration for the “ultrafast” experimental community to look for “unreasonably fast” electronic thermalization in strange metals.