The imaginary part of the high-order harmonic cutoff EMILIO PISANTY, MARCELO F. CIAPPINA, MACIEJ LEWENSTEIN, ICFO-The Institute of Photonic Sciences — High-harmonic generation - the emission of high-frequency radiation by the ionization and subsequent recollision of an electron driven by a strong laser field - has been explained over the past two decades using a semiclassical formalism, derived from a saddle-point approximation, where each saddle corresponds to a complex-valued trajectory. The classification of these saddles into separate families is a central task when using saddle-point methods, but it has received comparatively little attention since the discovery of the approach. In this work we present a novel scheme to classify the different trajectories, based on an identification of the (complex) time that corresponds to the cutoff, given by a zero of an appropriate derivative of the action. We demonstrate this method on bicircular fields of varying intensities, where the different trajectories morph and re-connect to form nontrivial topologies. In addition, we show that this interpretation of the harmonic cutoff coincides with the known scaling laws, and allows them to be easily extended to nontrivial fields. Moreover, this approach provides a natural interpretation to the imaginary part of the high-harmonic cutoff, which controls the strength of quantum-path interference between the trajectories it separates.

Emilio Pisanty
ICFO-The Institute of Photonic Sciences