

Ray Chaos-based control of modes in a multimode optical fiber

A multimode optical fiber acts as a versatile tool to probe the spatial properties of waves in systems in which the rays' dynamic is complex in the geometrical limit.

Indeed, the transverse cross section of a truncated fiber is analogous to a 2D-billiard, the paradigm of Ray Chaos. By playing on the level of truncation, one can explore a variety of complex dynamics and thereafter their effects on the waves properties.

Strongly affected by the nature of the underlying rays' dynamics, the modes in such systems present surprising properties as strong spatial localizations along stable or unstable periodic orbit as well as singular spectral signatures for some family of modes.

In this presentation, I will report experiments and numerical investigations on the observation and analysis of these singular signatures. I will discuss also the way these can be exploited to control the modes in a highly multimode optical fiber for telecommunications and optical imaging.