Delayed feedback control of self-mobile cavity solitons in a wide-aperture laser with a saturable absorber

Svetlana V. Gurevich[1], **Christian Schelte**[1], **Krassimir Panajotov**[2], **Mustapha Tlidi**[3]

[1] *University of Münster, Germany (e-mail: gurevics@uni-muenster.de, c.schelte@uib.cat)*
[2] *Vrije Univeristeit Brussel, Belgium (e-mail: kpanajot@b-phot.org)*
[3] *Université Libre de Bruxelles, Belgium (e-mail: mtlidi@ulb.ac.be)*

We investigate the spatiotemporal dynamics of cavity solitons in a broad area vertical-cavity surface-emitting laser with saturable absorption subjected to time-delayed optical feedback in a self-imaging configuration where diffraction in the external cavity is negligible. Using bifurcation analysis, direct numerical simulations, and numerical path-continuation methods, we identify the possible bifurcations and map them in a plane of feedback parameters. We show that for both the homogeneous and localized stationary lasing solutions, the time-delayed feedback induces complex spatiotemporal dynamics, in particular a period doubling route to chaos, quasiperiodic oscillations, and multistability of the stationary solutions. Finally, we show that the delay impacts both stationary and moving solutions either causing drifting and wiggling dynamics of initially stationary cavity solitons or leading to stabilization of intrinsically moving solutions.