

# Supercritical and subcritical period doubling bifurcations - influence of near-resonant and resonant perturbations

Martin Diestelhorst, Sebastian Lemm, Kay Barz, & Horst Beige

Martin-Luther-University Halle-Wittenberg, Institute of Physics, von-Danckelmann-Platz 3, 06120 Halle, Germany

[diestelhorst@physik.uni-halle.de](mailto:diestelhorst@physik.uni-halle.de)

Using different ferroelectrics as nonlinear capacitors in a series resonance circuit gives rise to different kinds of bifurcations. Both supercritical and subcritical period doubling bifurcations could be observed depending on the choice of the ferroelectric. Whereas triglycine sulphate (TGS) in the circuit caused supercritical period doubling bifurcations, we observed subcritical period doubling bifurcations when we used a relaxor ferroelectric lead magnesium niobate-lead titanate (PMN-PT). In both systems we investigated the influence of both near resonant and resonant perturbations on the bifurcations experimentally. We observed the shift of the bifurcation points under the influence of perturbation compared to the unperturbed bifurcation. The phenomena are discussed in the framework of the corresponding center manifold. It was predicted earlier that tuning the resonance circuit towards a period doubling bifurcation under the action of a near resonant or resonant perturbation, may yield an amplification of the perturbation in the vicinity of the bifurcation. This effect of small signal amplification was investigated with respect to its applicability as a detector for signals, which may be coupled into the circuit via the special properties of the ferroelectric materials.