

NUMERICAL STUDIES OF NONLINEAR DELAY DIFFERENTIAL EQUATIONS. *E. Hinke, T. Wiandt*, Department of Mathematics and Statistics, ehinke1185@aol.com, tiwsma@rit.edu*

Applications of semiconductor lasers span a broad range of areas from optical communication to optical ranging and sensing. Semiconductor lasers are extremely sensitive to optical feedback, which results from undesired reflections from optical elements and detectors. A small amount of feedback is sufficient to produce chaotic instabilities. In 1980, Lang and Kobayashi formulated a model consisting of two ordinary delay differential equations for the complex electrical field and the carrier number. Delay differential equations are difficult to explore analytically or even numerically. In our research we used cutting edge numerical softwares like XPP and DDE-BIFTOOL to investigate the Lang-Kobayashi equations for short external cavity. We discovered that it is possible to find regions in the roundtrip time – feedback level plane where periodic intensity pulsation solutions appear. We present some interesting numerical results and talk about possible further directions.