1067-37-313 **Christina Battista***, School of Mathematical Sciences, 85 Lomb Memorial Drive, Rochester Institute of Technology, Rochester, NY 14623, and **Jeannette Benham**, Department of Mathematics, PO Box 5000, Bard College, Annandale-on-Hudson, NY 12504-5000. *Bifurcation structure of external cavity mode and compound laser mode solutions.*

External cavity semiconductor lasers are commonly used in various important fields such as optical fiber communications and data recording. The main model in the understanding of the dynamics of these lasers is the well-known Lang-Kobayashi equations, consisting of two delay differential equations for the complex electrical field E and the carrier number density N. The model contains five parameters and exhibits various bifurcations. In our research, we were interested in special solutions, called External Cavity Mode (ECM) solutions. These solutions appear through saddle-node bifurcations as the feedback parameter is changed, then lose stability through a Hopf bifurcation at higher feedback levels. We investigated the structure of these bifurcations on the feedback level-external cavity roundtrip time parameter space and established the possibility of the coexistence of stable ECM solutions. In the more difficult case of delay-coupled lasers, solutions of analogous form are called Compound Laser Mode (CLM) solutions. We also studied the stability of these solutions and the bifurcation possibilities as the detuning parameter changed. Our goal is to extend this analysis to describe the full bifurcation structure of CLM solutions. (Received August 19, 2010)