Non-linear dynamics of ring lasers with amplitude dependent oscillations

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Modern Ring Lasers (RL), based on Sagnac effect, are standard inertial sensors in estimating rotation rates with applications ranging form inertial guidance, to angle metrology, geodesy, geophysics, and General Relativity tests. A semi-classical quantum mechanics calculation, involving a third order expansion of the polarization of the active medium in powers of the electric field in the cavity, provides the non-linear differential equations ruling the dynamics of RL. These equations exhibit fixed points and limit cycles, since the non-linear competition of the light intensities affects the linear harmonic evolution of the light phases. In this talk the RL equations are presented, together with approximate solutions and solutions retrieved with some assumptions on the parameters of the RL equations. Finally, the research topics on RL equations are introduced and new perturbation schemes are presented.