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Observation and modelling of uneven mode-spacing and frequency-pulling in helium-neon lasers JEFFREY PHILIPPSON, MATTHEW ROMEREIN, STEPHEN MCMURTRY, RALPH SHIELL, Trent University — The precise optical frequencies emitted by a laser are influenced by both the cavity and the detailed properties of the gain medium. Variation in refractive index in the region around a lasing transition leads to the phenomenon of frequency-pulling due to the presence of the laser cavity. We have explored the dependence of this phenomenon on cavity length for two internal-mirror He-Ne lasers as the bare cavity modes are tuned across the gain profile. The beat between two adjacent modes is seen to fall within two distinct frequency regions, depending on their relative polarizations. We have modelled the effects of specific refractive index profiles and mirror birefringence, and compared them with experimental results. A complete understanding of this effect may provide useful information about laser properties such as the complete gain profile, round-trip losses and nonlinear behavior.

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