Laser Modeling: A Numerical Approach with Algebra and Calculus

Mark Steven Csele

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Offering a fresh take on laser engineering, **Laser Modeling: A Numerical Approach with Algebra and Calculus** presents algebraic models and traditional calculus-based methods in tandem to make concepts easier to digest and apply in the real world. Each technique is introduced alongside a practical, solved example based on a commercial laser. Assuming some knowledge of the nature of light, emission of radiation, and basic atomic physics, the text:

- Explains how to formulate an accurate gain threshold equation as well as determine small-signal gain
- Discusses gain saturation and introduces a novel pass-by-pass model for rapid implementation of "what if?" scenarios
- Outlines the calculus-based Rigrod approach in a simplified manner to aid in comprehension
- Considers thermal effects on solid-state lasers and other lasers with new and efficient quasi-three-level materials
- Demonstrates how the convolution method is used to predict the effect of temperature drift on a DPSS system
- Describes the technique and technology of Q-switching and provides a simple model for predicting output power
- Addresses non-linear optics and supplies a simple model for calculating optimal crystal length
- Examines common laser systems, answering basic design questions and summarizing parameters
- Includes downloadable Microsoft® Excel™ spreadsheets, allowing models to be customized for specific lasers

Don't let the mathematical rigor of solutions get in the way of understanding the concepts. **Laser Modeling: A Numerical Approach with Algebra and Calculus** covers laser theory in an accessible way that can be applied immediately, and numerically, to real laser systems.

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