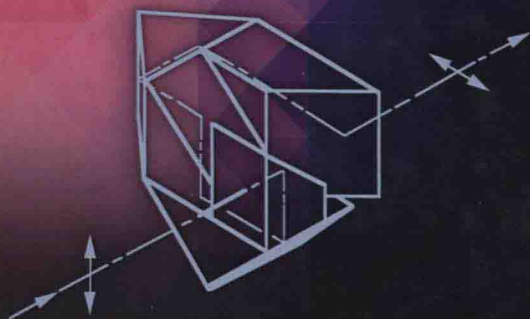
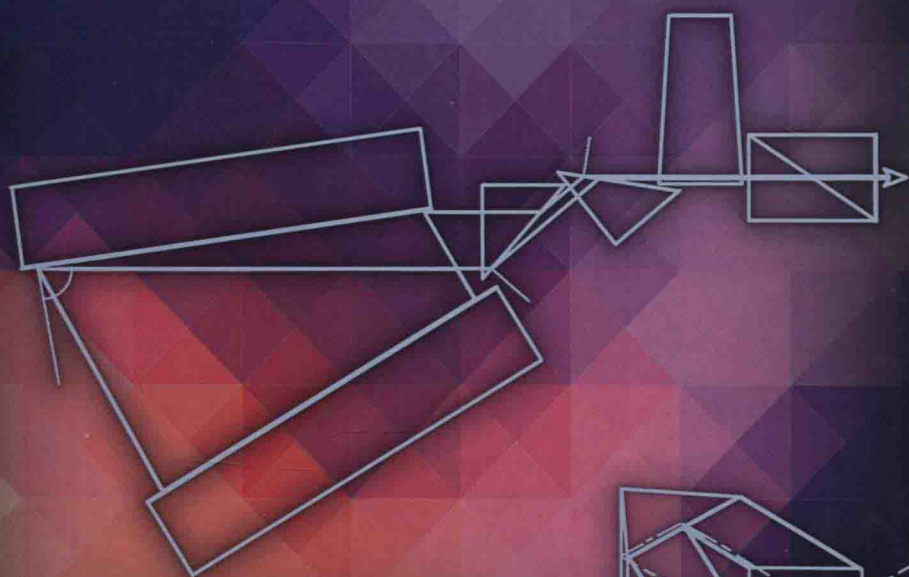


SECOND EDITION



# Tunable Laser Optics

F.J. Duarte



CRC Press  
Taylor & Francis Group

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**F.J. Duarte**

INTERFEROMETRIC OPTICS, ROCHESTER, NEW YORK, USA



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SECOND EDITION

# **Tunable Laser Optics**



# *Dedication*

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*To my family.*



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# Preface

Broadly tunable lasers have had, and continue to have, an enormous impact in many and diverse fields of science and technology. From a renaissance in spectroscopy, to laser guide stars, to laser cooling, the nexus is the tunable laser. *Tunable Laser Optics* was conceived from a utilitarian perspective to distill into a single, and concise, volume the necessary optics to provide the foundations necessary to work efficiently and productively in an environment employing tunable lasers. The theoretical tools presented in this book use humble, practical mathematics. Mainly derived from the application of Dirac's notation, these tools are widely applicable throughout optics: from interference, to diffraction, to refraction, to dispersion, and to reflection. Although the emphasis is on optics involving macroscopic low-divergence, narrow-linewidth lasers, some of the principles described are also applicable to the microscopic and nanoscopic domains.

The style, and selection of subject matter, in this book was determined by a desire to reduce entropy in the search for information in this wonderful and fascinating field. Albeit the physics and the optics included are based on firm and ageless principles, this second edition offers a revised, expanded, and updated version of the first edition published in 2003.

**F. J. Duarte**  
*Interferometric Optics*



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# Author

**F. J. Duarte** graduated with first-class honors in physics from the School of Mathematics and Physics at Macquarie University, Sydney, Australia, where he was also awarded a PhD in physics for his research on optically pumped molecular lasers. At Macquarie, he was a student of the well-known quantum physicist J. C. Ward. Duarte's research has taken place at a number of institutions in academia, industry, and the defense establishment. He is a research physicist at Interferometric Optics, Rochester, New York, and an adjunct professor at the electrical and computer engineering department, University of New Mexico, Albuquerque, New Mexico. He is the author of the generalized multiple-prism dispersion theory and has made various unique contributions to the physics and architecture of tunable laser oscillators. He has also pioneered the use of Dirac's quantum notation in interferometry, oscillator physics, and classical optics. These contributions have found applications in the design of laser resonators, laser pulse compression, imaging, microscopy, medicine, optics communications, and the nuclear industry. He is the lead author of numerous refereed papers and several US patents. Duarte is the author and editor of *Dye Laser Principles* (Academic Press, 1990), *High-Power Dye Lasers* (Springer-Verlag, 1991), *Selected Papers on Dye Lasers* (SPIE, 1992), *Tunable Lasers Handbook* (Academic Press, 1995), *Tunable Laser Applications* (1st edition, Marcel Dekker, 1995; 2nd edition, CRC Press, 2009), and *Coherence and Ultrashort Pulsed Laser Emission* (InTech, 2010). He is also the sole author of *Tunable Laser Optics* (1st edition, Elsevier Academic Press, 2003) and *Quantum Optics for Engineers* (CRC Press, 2014). Dr. Duarte is a fellow of the Australian Institute of Physics and a fellow of the Optical Society of America. He received the Engineering Excellence Award from the Optical Society of America.



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