



Lasers in medical diagnosis and therapy by Stephan Wieneke and Christoph Gerhard

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Medical lasers are a common surgical and diagnostic tool found in medicine and are used in many surgical and medical settings. Some of the key advantages lasers can provide mean that medical lasers are used in a wide range of applications including tissue cutting, ablation and photochemical activation of pharmaceuticals at a particular site, amongst many other uses. This textbook is authored by two of the leading experts in the field, Stephan Wieneke and Christoph Gerhard. Stephan Wieneke is an expert in laser-plasma-hybrid technology who has taught applied laser medicine and has been involved in the development and establishment of a medical engineering university course. Christoph Gerhard is an expert in laser and plasma technology as well as optical system design and is the main editor of a reference book on laser ablation. “Lasers in Medical Diagnosis and Therapy” provides a much needed overview of medical lasers in medicine that would form the basis of a comprehensive university level course or short reference for the expert.

The book contains five chapters. The first describes the basic principles and theory of laser generation and irradiation. The chapter describes the generation of laser irradiation and the types of lasers used in medicine limited to solid state lasers, gas lasers and dye lasers. Some basic laser safety aspects are described, specifically illustrating the effective depth of penetration of the laser energy through skin as the wavelength of the laser irradiation varies. This chapter, as does each chapter, ends a series of dot points summarising the basic concepts covered by the chapter.

The second chapter concentrates on generalised medical laser designs. It covers the general setup and guidance of the laser beam in medical lasers, as well as the accessories and

end pieces used to focus the laser irradiation into a clinical useful beam. The transmission of laser irradiation via mirror-based joint systems and a variety of optical fibre systems are described as are immersion liquids commonly used.

Chapter three covers the tissue optics and the interactions of the laser energy with tissue. This chapter has useful data and diagrams needed to help understand the absorption and transmission of laser energy in tissue. The various absorption coefficients and detailed mathematical models describing scattering of laser irradiation are given. The effect of heat flow and dissipation by conduction and blood flow are described. The complex interactions of laser irradiation with tissue are comprehensively described with a useful list of references given at the end of the chapter, as for all other chapters in this textbook.

The fourth chapter describes medical diagnostics able to be performed using lasers. There are ten diagnostic techniques using lasers that the authors provide to illustrate the common and novel medical uses of lasers. These techniques are basically presented by the authors in terms of the mechanism by which the laser irradiation is used to measure a physical parameter corresponding to a diagnostic indicator.

The fifth chapter covers the therapeutic uses of lasers in medicine, grouped into surgical and medicine specialty by the authors. The major uses of laser irradiation is covered for orthopaedics, urology, ophthalmology, oncology, cardiology, surgery and dermatology.

I found the book well-structured and easy to follow. The text has been written by physicists and concentrates on the physical mechanisms of laser generation, transmission and energy absorption in tissue. The figures are in colour and of a high quality. This book meets its goal of being a reference that can be used as a textbook by teachers and students for lectures and by laser safety experts when preparing material to provide laser safety training to non-physicists. I think that the detailed descriptions of the interactions of laser irradiation with tissue is particularly useful when explaining the various biological effects to clinicians and nursing staff

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involved in medical laser use. I think that the book should also be valuable to researchers in and students of medical physics, biomedical engineering, medicine and surgery.

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