

# Preface to the Fifth Edition

The second volume of “Laser Spectroscopy” covers the different experimental techniques, necessary for the sensitive detection of small concentrations of atoms or molecules, for Doppler-free spectroscopy, laser-Raman-spectroscopy, double-resonance techniques, multi-photon spectroscopy, coherent spectroscopy and time-resolved spectroscopy. In these fields the progress of the development of new techniques and improved experimental equipment is remarkable. Many new ideas have enabled spectroscopists to tackle problems which could not be solved before. Examples are the direct measurements of absolute frequencies and phases of optical waves with frequency combs, or time resolution within the attosecond range based on higher harmonics of visible femtosecond lasers. The development of femtosecond non-collinear optical parametric amplifiers (NOPA) has considerably improved time-resolved measurements of fast dynamical processes in excited molecules and has been essential for detailed investigations of important processes, such as the visual process in the retina of the eye or the photosynthesis in chlorophyll molecules.

In particular, the applications of laser spectroscopy in chemistry, biology medicine and for the solution of technical problems have made rapid progress. This is illustrated by several examples in the last chapter.

In this new edition some recent developments are discussed, as for instance the application of optical combs to precision molecular spectroscopy and its extension into the far UV region, to metrology, to astronomy and as frequency normal for the global positioning system. The progress in the controllable generation of high harmonics with frequencies up into the X-ray region and with a time resolution in the attosecond time scale are outlined and also new techniques of cooling and trapping of atoms or molecules in various realizations of optical traps are presented.

For several sections of Vol. 2 some basic knowledge of spectroscopic techniques or instrumentation is necessary. Therefore, cross links to Vol. 1 are given, where the fundamentals of laser spectroscopy are discussed.

At the end of each chapter some problems are given, which should help the students to check their understanding of the subject treated in the corresponding chapter. The solutions are given at the end of the book.

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He will appreciate any future cooperation of readers for improving this textbook. Any mail with questions or suggestions for corrections will be answered as soon as possible.

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Experimental Techniques

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