

FORTHCOMING PAPERS

On the High-Voltage Regime of the Discharge in Hollow-Cathode-Tube

J. Mizeraczyk, M. Neiger (F. R. Germany)

A comparison of the operating characteristics of the high-voltage regime of the discharge in a hollow-cathode tube, the hollow-cathode discharge (HCD) and the discharge to a plane cathode are presented. The disappearance of the hollow-cathode effect and the transition to a high-voltage discharge after inserting several anode rods into the cathode cylinder is exhibited. The similarity between the operating characteristics of such a high-voltage discharge and of a plane cathode discharge is shown. The loss of ions at the anode rods, as well as insulators or floating conductors is believed to be the reason behind the increase of the operating voltage and the disappearance of HCD characteristics. Practical means of increasing the operating voltage are mentioned.

Prospects for Vapor-Phase Dye Lasers

Yu. Yu. Stoilov (USSR)

This review covers the field of vapor-phase dye lasers (VPDL) with special emphasis on prospects of gas lasers with optical pumping. Some peculiarities of the gaseous active medium and a possibility to control its density near the critical point are discussed. High specific laser energies ($\sim 0.3 \text{ J/cm}^{-2}$), low thresholds, and high efficiencies (20 — 40%) made it possible to construct a powerful tunable VPDL.

Investigation of Stimulated Brillouin Scattering Under Well-Defined Interaction Conditions. II. Experimental Results and Interpretations

B. Gellert, B. Kronast (F. R. Germany)

The spatial and temporal development of the SBS ion wave was investigated extensively by ruby-laser light scattering techniques using a picosecond streak-camera for recording. The measurements performed for various levels of peak backscattering provide the ion wave energy density as a function of space, time and backscatter level, i. e. peak power density of CO_2 laser radiation focussed into an underdense and homogeneous target plasma of large extent. In an attempt to understand the various experimental aspects, numerical solutions of respective theories were compared with observations. Whilst for backscatter levels below 5% the three-wave description of Forslund et al. [11] does suffice, it took an extensive review of nonlinear mechanisms to pin down harmonic production of the ion wave according to Karttunen and Salomaa [23] as the process governing SBS behaviour above 5% up to the Manley-Rowe limit. The corresponding system of four-wave equations is capable to explain reasonably well all the aspects observed; in particular, it shows, how it comes about that the dangerous Manley-Rowe limit is reached already at moderate power densities below 10^{13} W/cm^2 such as in [1]. From this description, it is also evident that — by contrast to many other aspects of laser fusion — this is an effect which becomes the more serious the shorter the laser wavelength is.

Infrared Multiphoton Dissociation of Unsubstituted Metal Carbonyls at $5 \mu\text{m}$

Mei-Kuen Au, P. A. Hackett, M. Humphries, P. John (Canada)

A frequency-doubled carbon dioxide laser of modest output energy (1 mJ) has been used to study, for the first time, the infrared multiphoton absorption by, and dissociation of, the unsubstituted carbonyls of vanadium, chromium, iron, nickel, molybdenum, and tungsten. The multiphoton absorption cross-sections measured for $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{Cr}(\text{CO})_6$, $\text{Mo}(\text{CO})_6$, and $\text{V}(\text{CO})_6$ are high $\sigma \sim 2 \times 10^{-17}$ and ensure facile multiphoton dissociation. In focussed beams a pressure independent reaction yield proportional to the 1.5 power of the beam energy is observed for $\text{Fe}(\text{CO})_5$, $\text{Cr}(\text{CO})_6$, and $\text{Mo}(\text{CO})_6$ implying threshold fluences of only 32, 25, and 26 mJ cm^{-2} , respectively. The stoichiometry of the reaction, observed by a pressure measurement technique, is consistent with production of metal atoms and carbon monoxide as final products for $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{Cr}(\text{CO})_6$, and $\text{Mo}(\text{CO})_6$. This extensive decarbonylation along the ground state surface is consistent with recent studies of the photochemistry of these molecules from excited electronic states.

Continued on page A6

Laser Spectroscopy VI

Proceedings of the Sixth International Conference, Interlaken, Switzerland, June 27 - July 1, 1983

Editors: H.P. Weber, W. Lüthy

1983. 258 figures. XVII, 442 pages.
(Springer Series in Optical Sciences, Volume 40)
Cloth DM 75,—; approx. US\$ 29.10
ISBN 3-540-12957-X

This book contains the proceedings of the "Sixth International Conference on Laser Spectroscopy" (SICOLS '83), held at Interlaken, Switzerland, June 27th to July 1st, 1983. The technical program recorded in this volume included 61 oral and 82 poster presentations dealing with new and important developments in laser spectroscopy. The emphasis of the meeting was on:

- Fundamental applications
- Novel spectroscopy
- Progress in new coherent sources
- Cooling, trapping and control of ions, atoms, and molecules
- Surface and solid state studies
- Spectroscopy of unstable species



Springer-Verlag
Berlin Heidelberg
New York Tokyo

Tiergartenstr. 17, D-6900 Heidelberg 1 or 175 Fifth Ave., New York, NY 10010, USA
or 37-3, Hongo 3-chome, Bunkyo-ku, Tokyo 113, Japan

71 40/4/4

Applied Physics A 32, No. 4 (1983)

Invited Paper

L. Schlappbach, T. Riesterer

The Activation of FeTi for Hydrogen Absorption 169

Contributed Papers

W. Puff, P. Mascher, P. Kindl, H. Sormann

On the Temperature Dependence of Positron Lifetimes in Tin and the Transition from the β - to the α -Phase 183

N. R. Saha, D. Roychoudhury, P. K. Basu

Analytical Study of the Performance of minSIS Solar Cells with a Back Surface Field 187

J. H. Neave, P. J. Dobson, J. J. Harris, P. Dawson, B. A. Joyce

Silicon Doping of MBE-Grown GaAs Films 195

G. Falcone, A. Oliva

Energy Spectra of Atoms Sputtered by KeV Light-Ion Bombardment 201

R. Pedrys, L. Gabla

Photon Emission from Sputtered Nickel Atoms as a Function of Target Temperature Near the Curie Point 205

R. P. Bhardwaj, K. K. Nagpaul, J. K. Quamara, B. L. Sharma

On the Occurrence of an Excitation-Effect in Pyromellitimide Thin Film 211

H. Hora

Stresses in Silicon Crystals from Ion-Implanted Amorphous Regions 217

M. Anwar Butt, M. Zafar Iqbal

"0.75 eV Killer Centre" in Red-Emitting GaP LEDs 223

FORTHCOMING PAPERS (CONT'D)

Identification of the Origins of Photoionisation in CO₂ TEA Lasers

S. J. Scott, A. L. S. Smith (U. K.)

In sealed CO₂ spark preionised lasers the preionisation is largely due to photoionisation of NO and NO₂, in seeded TEA lasers it originates from the low ionisation potential additive used. Unseeded and flowing gas lasers can still be successfully preionised but the source of this preionisation has remained a mystery; previous attempts to isolate and identify low I. P. gaseous impurities have failed. We have now identified these, using a combination of cryogenic impurity concentration and mass spectroscopy and found them to be a complex mixture of hydrocarbons (C₂—C₇). Of these hydrocarbons, the alkenes are found to be predominantly responsible for the photoionisation and are present in concentrations of ~ 0.5 ppm. Deliberate addition of one of these alkenes, propene, to a uv preionised CO₂ TEA laser was found to enhance the lasers performance at high energy loadings.

CW and Pulsed FIR-CO₂ Hybrid Laser with Improved Efficiency and Amplitude Stability at Short FIR Wavelengths

Z. Šolajić, J. Heppner (F. R. Germany)

For the first time stable cw output of a FIR-CO₂ hybrid laser has been achieved at wavelengths shorter than 300 μm. Due to the saturable absorber characteristic of the FIR laser gas, cw or pulsed emission is observed on both, the CO₂ and the FIR laser output, depending on the operating conditions. Results are reported on different resonant lines in CH₃OH and the 67 μm Raman line in NH₃. The good efficiency of this laser is also demonstrated by the excitation of two new emission lines in CH₃OH, namely 49 and 56 μm, pumped by 9R (22) and 9R (24), respectively.

Locking the Laser Frequency to an Atomic Transition

W. Jitschin (F. R. Germany)

A simple method for stabilizing the laser frequency to an atomic transition is described. It makes use of the frequency shift caused by the Doppler effect. With this method the frequency of a dye laser be kept tuned to an atomic resonance line within 10% of the linewidth for periods of several hours.

Transverse Mode Dynamics in a Free-Electron Laser

P. Elleaume, D. A. G. Deacon (France)

We derive the most general equations of motion for the electrons and the electromagnetic field in a free-electron laser including the effects of diffraction and pulse propagation. The field evolution is expressed in terms of the amplitudes and phases of a complete set of transverse modes. The analytic solution is given in the small-signal regime, where the theory is shown to be in excellent agreement with a recent experiment at Orsay.

Effective and Simplified Hybrid TEA Laser Design and Operation

G. Scott, A. L. S. Smith (UK)

A compact hybrid TEA CO₂ laser has been developed which, when operated with the low pressure section well below oscillation threshold, demonstrates that little cw gain is necessary to ensure single longitudinal mode (SLM) output pulses with peak power, energy and pulse shape approaching those of normal multimode operation. This has allowed reliable, SLM operation to be obtained with a very short, wide bore rf-excited low-pressure section, making feasible simple single-mode, large-aperture TEA lasers with high peak powers and energies.

Self-Phase Locking in Lasers with Homogeneously Broadened Emission Lines

W. Brunner, R. Fischer, H. Paul (German Democratic Republic)

It is shown by numerical analysis based on Lamb's equations of motion, that standing wave lasers with purely homogeneously broadened emission lines exhibit regular multimode oscillations. Specifically, modes lying far from the line centre are quenched due to mode competition, and the amplitudes of the oscillating modes approach steady-state values. The stabilization of the amplitudes is normally accompanied, or followed, by an evolution of the phases towards a phase-locked regime, where the relative phases $\psi_n = 2\phi_n - \phi_{n+1} - \phi_{n-1}$. [ϕ_n phase in the n -th mode, defined by (6)] attain either the value 0 or $\pm\pi$. The build-up times for the relative phases are found to vary over a wide range.

Picosecond Phenomena

Picosecond Phenomena I

Proceedings of the First International Conference on Picosecond Phenomena, Hilton Head, South Carolina, USA, May 24–26, 1978

Editors: C. V. Shank, E. P. Ippen, S. L. Shapiro

1978. 222 figures, 10 tables. XII, 359 pages
(Springer Series in Chemical Physics, Volume 4)
Cloth DM 69,-; approx. US \$ 29.80. ISBN 3-540-09054-1

Contents: Interactions in Liquids and Molecules. – Poster Session. – Sources and Techniques. – Biological Processes. – Poster Session. – Coherent Techniques and Molecules. – Solids. – High-Power Lasers and Plasmas. – Postdeadline Papers.

Picosecond Phenomena II

Proceedings of the Second International Conference on Picosecond Phenomena, Cape Cod, Massachusetts, USA, June 18–20, 1980

Editors: R. Hochstrasser, W. Kaiser, C. V. Shank

1980. 252 figures, 17 tables. XII, 382 pages
(Springer Series in Chemical Physics, Volume 14)
Cloth DM 74,-; approx. US \$ 31.90. ISBN 3-540-10403-8

Contents: Advances in the Generation of Picosecond Pulses. – Advances in Optoelectronics. – Picosecond Studies of Molecular Motion. – Picosecond Relaxation Phenomena. – Picosecond Chemical Processes. – Applications in Solid State Physics. – Ultrashort Processes/Biology. – Spectroscopic Techniques. – Index of Contributors.

Picosecond Phenomena III

Proceedings of the Third International Conference on Picosecond Phenomena, Garmisch-Partenkirchen, Federal Republic of Germany, June 16–18, 1982

Editors: K. B. Eisenthal, R. M. Hochstrasser, W. Kaiser, A. Laubereau

1982. 288 figures. XIII, 401 pages
(Springer Series in Chemical Physics, Volume 23)
Cloth DM 66,-; approx. US \$ 28.50. ISBN 3-540-11912-4

Contents: Advances in the Generation of Ultrashort Light Pulses. – Ultrashort Measuring Techniques. – Advances in Optoelectronics. – Relaxation Phenomena in Molecular Physics. – Picosecond Chemical Processes. – Ultrashort Processes in Biology. – Applications in Solid-State Physics. – Index of Contributors.

Prices are subject to change without notice



Springer-Verlag
Berlin Heidelberg New York Tokyo

Tiergartenstr. 17, D-6900 Heidelberg 1 or 175 Fifth Ave., New York, NY 10010, USA
or 37-3, Hongo 3-chome, Bunkyo-ku, Tokyo 113, Japan

6886/4/2ha