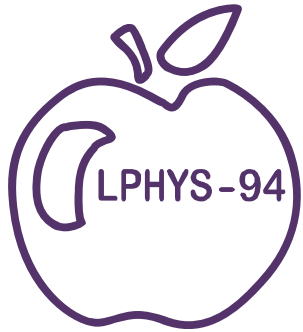
INTERNATIONAL WORKSHOP
on
LASER PHYSICS



TRANSIENT COHERENT PHENOMENA

Workshop Organizers

City College of the City University of New York
Columbia University, New York
General Physics Inst. of the Russian Academy of Sciences
Joint Institute for Nuclear Research, Dubna

October 10 -14, 1994
at
The Graduate School and University Center
The City University of New York
33 West 42 street

We gratefully acknowledge the financial support of the following organizations:
- City College of the City University of New York
- Columbia University
- International Science Foundation
- The Graduate School and University Center, CUNY

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WORKSHOP SECRETARIAT
at THE CITY COLLEGE OF NEW YORK

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GENERAL INFORMATION

BACKGROUND

The third annual International Workshop on Laser Physics is held on Oct. 10-14, 1994 in midtown Manhattan at The Graduate School of The City University of New York. The workshop presents an international forum for the discussion of all aspects of transient coherent phenomena. The program includes sessions on topics of interest to physicists, chemists, biologists and electrical engineers pursuing research in transient phenomena.
As part of the Workshop, a symposium on Photon Echo is organized to celebrate the 30th anniversary of the experimental observation of this effect.

REGISTRATION

The registration fees for the workshop are $250. - ($75.- for students). These fees include admission to the technical sessions coffee breaks and the registration folder.
The registration folders may be picked up on Sunday October 9 from 5:00-10:00 PM from room 26 at the Iroquois Hotel, located at 49 W, 44 St. On other days, from 8:30am to 6:00PM, from the registration desk outside the Auditorium.

MEETING FORMAT

The format of the meeting is single session consisting of invited and contributed papers.
All sessions will be held in the Harold Proshansky Auditorium at the CUNY Graduate School.

PROCEEDINGS

Papers presented at LPHYS-94 will be featured in a special issue of the international journal "Laser Physics", scheduled for publication in Spring 1995. All manuscripts are due by October 14, 1994.

SPEAKER/ PRESIDER CHECK-IN

All speakers and presiders are kindly requested to check in at the registration desk. Authors are requested to preview and preload their slides at least 30 minutes before their session begins. Slides may be retrieved at the same location after the session. Universal trays will be available for each author. Presiders are requested to check in at the registration desk for a quick review of equipment and procedures.

AUDIO-VISUAL EQUIPMENT

The Auditorium will contain the following audiovisual equipment:
- Podium microphone
- Wireless microphones
- Overhead projector
- Slide projector
-VCR projector
-Screen

BANQUET

The Workshop banquet will be held Wednesday Oct. 12, at 8:00 PM. Tickets for which may be purchased from the registration desk.

FACILITIES

- Coffee is served at the coffee breaks in the lobby outside the Auditorium.
- Room 207 will be available for small groups' discussions.
- Lunch, snacks, and dinners are available on cash basis Tuesday through Friday in the Cafeteria and Lounge Area located on the 18th floor.
- Participants may use the coin-operated Xerox machines located in the Graduate Center Library for their copying needs.
- The Science and Technology Section of the New York Public Library, Research Division, located across the street from the Graduate School houses one of the best scientific and technical reference collections.

SIGHTSEEING, SHOPPING, DINING, ENTERTAINMENT

Please consult the New York information package provided in the registration folder for detailed suggestions.
For assistance in the choice of places to visit, the registration desk and members of the Workshop's Secretariat will try their best to help. No organized tours are planned by the Workshop.

COMMERCIAL ENDORSEMENTS

The Workshop Organizers request all participants to use their discretion in the distribution of promotional materials for commercial products and publications. No endorsement is implied by the Workshop or its Institutional Organizers for any product or publication.

MONDAY, OCTOBER 10, 1994

M 8:30 Registration

OPENING SESSION

Jamal T. Manassah, Presiding

M 10:00 Introductory Remarks
The Steering Committee

M 10:15 Welcoming Remarks
- Yolanda Moses (President, City College of the City University of New York)
- Frances Degen Horowitz (President, The Graduate School and the University Center, City University of New York)
- Michael Crow (Vice-Provost, Columbia University)
- Irwin Polishook (President, Professional Staff Congress, The City University of New York)

M 10:40 Sven R. Hartmann (Columbia University, New York, NY)
Coherence Inhibition in Cascade Fluorescence
S. R. Hartmann

A synchronously pumped laser is amplified to produce lOps pulses at 855nm in order to two-photon excite a nonradiating 6S t(l-6D3f2 coherence. Superfluorescence at 876nm corresponding to the 60Jn-6Ptf2 transition is observed along the forward (direction of pump) and backward direction. Superradiance is also observed in the forward direction on the lower 6Pt(l-6Stf2 transition. The radiation in the forward direction is always delayed (statistically) with respect to the backward direction. Although the forward direction is inhibited it nevertheless sometimes radiates more energy than its counterpart in the backward direction. Experimental details are discussed.

M 11:10 Ahmed H. Zewail (California Institute of Technology, Pasadena, CA)
Ultrafast Coherent Phenomena -- From Nano to Femtosecond Resolution
A. H.Zewail

We will review the development of ultrafast coherence techniques for probing atomic and molecular motions. We will discuss the concepts involved and present examples of the scope of applications. With the dramatic increase in time resolution, some new directions, which have evolved over the past decade, will be discussed.

11:50 - 1:00 : Lunch Break

PHOTON ECHO SYMPOSIUM

In celebration of the 30th anniversary of the observation of Photon Echo

Session 1: Valery M. Yermachenko, Presiding

M 1:00 Andreas C. Albrecht (Cornell University, Ithaca, NY)
Ultrasharp Spectra and Ultrafast Timing from Noisy Coherence in Four-Wave-Mixing
A. C. Albrecht, S. A. Schaertel, S. Smith, D. Tan & D. DeMott

Electronic and vibrational coherence in the molecular condensed phase are examined both in echo and coherent Raman configurations using FWM with "noisy" nanosecond pulses. Material frequencies at sublinewidth resolution (noise-nulled) can be obtained as well as femtosecond-scale dephasing rate constants (and lifetimes).

M 1:30 Roger M. Macfarlane (IBM Almaden Research Center, San Jose, CA)
Photon Echoes in Rare Earth Doped Solids - A Material Perspective
R. M. Macfarlane

I will review work done on the measurement of photon echoes in rare-earth doped insulators concentrating on the already demonstrated mechanisms for optical dephasing. These mechanisms include coupling to nuclear spin fluctuations, electron spin fluctuations, phonons and tunneling modes in glasses. The choice of materials demonstrating these different mechanisms will be discussed.

M 2:00 RichardS. Meltzer (Unive'i-sity of Georgia, Athens, GA)
Electric Field-Modulated Photon Echo: Application to Photo-Induced Electric Domains in Ruby
S. P. Feofilov, K. W. Jang, and R. S. Meltzer

Electric field-modulated two-photon echo experiments were performed in heavily doped ruby crystals containing photo-induced domains possessing internal electric fields. Studies as a function of the orientation of the optical beams to the crystal axis allow a determination of the domain structure which occurs in approximately 20 ~ thick sheets perpendicular to the c-axis.

M 2:30 Igor V. Yevseyev (Moscow Engineering Physics Institute, Russia)
Long-Lived Modified Stimulated Photon Echo
Yu. V. Men'shikova and I.V. Yevseyev

The intensity and polarization of the long-lived modified stimulated photon echo (LMSPE) are derived as function of the atomic nuclear spin. The possible use of polarization echo-spectroscopy on the basis of LMSPE is considered. The conditions under which the LMSPE signals can restore the information recorded in the temporal shape of the exciting pulses are given.

M 3:00 Natalja N. Rubtsova (Institute of Semiconductor Physics, Novosibirsk, Russia)
Intensity Dependence or Photon Echo Kinetics in Molecular Gas
L. S. Vasilenko, N. N. Rubtsova, and E. B. Hvorostov

Photon echo decay kinetics in SF6 under cw CO_2 laser radiation is studied for a wide range of experimental conditions. The contributions of the Dynamic Stark Effect and of the dipole-dipole exchange interaction to the intensity of the photon echo are examined.

M 3:15 A. G. Rudavets (Institute of Energy Problems of Chemical Physics, Chemogolovka, Moscow Region, Russia)
Photon Echoes or Pulsed Photodissociation via Photoinduced Harpoon Reactions
V. A. Dubovitskii, A.M. Dykhne, and A. G. Rudavets

Using numerical calculations, we simulate delayed nonlinear coherent transients for different models describing nonadiabatic transitions. Photon echoes associated with photodissociation are described by the evolution of wave packets. Harpoon like reactions caused by photons impact are shown numerically to exist. This leads to a qualitative understanding of matter-wave interference in bound-free transition.

3:30 - 4:00 : Coffee Break

Session 2: Michael D. Fayer, Presiding

M 4:00 Mark Berg (University of South Carolina, Columbia, SC)
Raman Echoes on Vibrations in Liquids
M. Berg, D. Vanden Bout, and J. Freitas

The Raman analogue of traditional echo pulse sequences is used to measure the dephasing dynamics of intramolecular vibrations in liquids. The results give information on the nature of the solvent forces which are important in perturbing nuclear motions in solution.

M 4:30 Michael D. Fayer (Stanford University, Stanford, CA)
Vibrational Dynamics or Liquids and Glasses Probed with IR Photon Echoes
M.D. Fayer

Picosecond infrared vibrational photon echoes are used to examine vibrational dynamics of solute molecules in liquids and glasses from room temperature to 10K. These are the first vibrational photon echo experiments conducted in liquids and solids. The experiments are performed with the Stanford superconducting linear accelerator pumped free electron laser.

M 5:00 Charles V. Shank (Lawrence Berkeley Lab., Berkeley, CA)
Femtosecond Photon Echo Measurements on Molecules in Liquids
C. V. Shank and C. J. Bardeen

This paper will describe the use of a novel mode cancellation 3 pulse photon echo technique to investigate dephasing of molecules in solution. The systematic variation in the dynamics of solvation will be described as a function of alcohol chain length.

M 5:30 Douwe A. Wiersma (Univ. of Groningen, The Netherlands)
Photon Echoes in Disordered Condensed Phase Systems
D. A. Wiersma

The low-temperature dynamics of photon echoes in glasses and proteins have been studied by the long-lived simulated photon echo as probe, on time scales from picoseconds to seconds. The results were modelled using the well-known two-level-system model for glasses. In the case of proteins, very specific two-level systems are found that possibly reflect global structural changes in agreement with molecular dynamics simulation studies.

TUESDAY, OCTOBER 11, 1994

SPECTRAL DIFFUSION

James L. Skinner, Presiding

T 8:30 Michel Orrit (C.P.M.O.H -C.N.R.S. - Universite Bordeaux I, France)
Investigation of Spectral Diffusion in Disordered Solids by Single Molecule Spectroscopy
L. Fleury, J. Bernard, R. Brown, and M. Orrit

Fluorescence excitation lines of single molecules in polymers at low temperatures jump spectrally. The fluorescence intensity correlation functions of different molecules have very different decay times and shapes. They can be modelled by a random distribution of two-level systems around the molecule. When such a system can be isolated, the temperature dependence of its jump rate points to phonon-assisted tunneling processes.

T 9:00 James L. Skinner (University of Wisconsin, Madison, WI)
Probing the Dynamics of Disordered Crystals: Spectral Diffusion of Individual Molecules
J. L. Skinner and P. Reilly

We discuss a general theory of spectral diffusion in disordered crystals. With this theory we analyze the experimental spectral diffusion trajectories of individual pentacene molecules in p-terphenyl crystal obtained by Moerner and coworkers. Our results yield detailed information about the two-level systems responsible for the spectral diffusion.

TRANSIENTS IN LIQUIDS

Douwe A. Wiersma, Presiding

T 9:30 Graham R. Aeming (University of Chicago, Chicago, IL)
Nonlinear Optical Studies of Chemical Dynamics in Solution
G. R. Fleming, T. Joo, M. Cho, andY. Jia

The applications of several femtosecond third and fifth-order echo-type spectroscopies to the study of solvent-solute interactions in polar liquids will be described.

T 10:00 Abraham Nitzan (Tel-Aviv University, Tel-Aviv, Israel)
Solvation Dynamics: Linear and Nonlinear Response
A. Nitzan

This talk will review recent numerical studies of solvation dynamics with particular emphasis on the following issues: (a) Applicability of linear response descriptions. (b) Importance of local modes of motion. (c) Origin of Brownian oscillator models. Different classes of dielectric solvents as well as electrolyte solutions will be considered.

10:30 - 11:00 : Coffee Break

ULTRAFAST CHEMICAL DYNAMICS

Kenneth B. Eisenthal, Presiding

T 11:00 Kenneth B. Eisenthal (Columbia University, New York, NY)
Chemical Dynamics at Liquid Interfaces
E. Borguet, X. Shi, and K. B. Eisenthal

Studies of the dynamics of excited state structural changes at air/liquid, liquid/liquid, and liquid/solid interfaces will be presented. The experiment is a pump-probe experiment that involves a femtosecond excatat1on pulse combined with a time-delayed probe pulse that generates second harmonic light from the interface.

T 11:30 Gustav G. Gerber (University of Freiburg, Germany)
Ultrafast Phenomena in Molecules and Cluster
G. Gerber

The real-time dynamics of multi photon ionization and fragmentation of sodium molecules and Nan and Hg0 cluster have been studied in femtosecond pump-probe molecular beam experiments. Na_2 and Na_3 results reveal unexpected features of the dynamics as seen in the spreading and reccurence of different vibrational wave-packets and in high laser fields. Cluster size dependent time-resolved studies of absorption resonances: lifetimes and decay processes with tunable fs laser pulses show different phys1cal processes for Na_n and Hg_n.

12:00 - 1:00 : Lunch Break

TRANSIENTS IN SEMICONDUCTORS

Duncan G. Steel, Presiding

T 1:00 Juergen Kuhl (Max-Planck-Institut für Festkorperforschung, Stuttgart, Germany)
Transient Degenerate-Four-Wave-Mixing on Exciton in GaAs Quantum Wells
J. Kuhl

The nonlinear optical response of 20 excitons in GaAs Quantum Wells is strongly influenced by coherent coupling of excitonic states via Coulomb interaction and sample disorder. Systematic experimental studies and theoretical modeling of the polarization dependence of time-integrated and time-resolved degenerate-four-wave-mixing experiments permit a qualitative differenuataon between different coupling mechanisms.

T 1:30 Arto V. Nurmikko (Brown University, Providence, Rl)
The Role of Electron-Hole Pair Correlations in Blue-Green Semiconductor Quantum Well Lasers
A. V. Nurmikko

The new wide-bandgap II-VI semiconductor blue-green diode lasers represent a potential new technology at short visible wavelengths. At the same time, the quantum well region shows strong 2-dimensional excitonic features in passive structures. More Important, even under laser diode injection conditions at room temperature, the gain spectra show clear evidence for the Coulomb binding of electron-hole pairs.

T 2:00 Kirill A. Prokhorov (General Physics Institute, Moscow, Russia)
Some Aspects of Resonant Hyper-Raman Spectroscopy of Semiconductors
K. A. Prokhorov

The theoretical and experimental study of the mechanisms of resonant Hyper-Raman scattering (H~S) in the wideband semiconductors are presented. Theoretical treatment includes a complete group analysis of the hyper-polarizability tensors and HRS selection rules for all types of crystal symmetry. Single and multi-phonon HRS due to the deformation potential and Frohlich electro-phonon interaction is considered for the cases of one and two-photon resonances with exciton levels. The odd parity multiphonon LO lines were proved experimentally to predominate in resonant Hyper-Raman spectra.

T 2:30 Duncan G. Steel (University of Michigan, Ann Arbor, MI)
Coherent Nonlinear Optical Phenomena of Excitons in Semiconductors
D. G. Steel, M. Jiang, K. Ferrio, and N. Bonadeo
Coherent nonlinear spectroscopy provides a powerful means to study relaxation and energy level structure in many resonant systems. However, the nonlinear optical response in semiconductors is greatly complicated by the strong optical coupling that leads to the formation of excitons and many body interactios. We will discuss some of the key aspects of optical interactions in semiconductor and provide physical understanding of these effects by modifications of the standard optical Bloch equations.

T 3:00 Michael Woerner (Max-Bom-Institut für Nichtlineare Optik und Kurzzeitspektroskopie, Berlin, Germany)
Relaxation Phenomena in Semiconductors
M. Woerner, and T. Elsaesser

Various relaxation processes in semiconductors occuring after femto- or picosecond photoexcitation like phase relaxation of the inter-band transition thermalization of non-equilibrium carrier distributions, cooling of the plasma. and recombination of earners with ionized impurities are discussed. Time-resolved experiments in the near- and mid-infrared on intrinsinc GaAs and on hole plasma in p-type Ge and GaAs are presented.

3:30 - 4:00 : Coffee Break

TRANSIENTS IN SOLIDS

Charles V. Shank, Presiding

T 4:00 John T. Fourkas (Massachusetts Institute of Technology, Cambridge, MA)

Dephasing-Induced Phenomena in Nonlinear Vibrational Experiments

J. T. Fourkas, H. Kawashima, and K. A. Nelson

Quantum vibrational modes support a wealth of nonlinear optical phenomena that are not seen in two-level systems. We develop the theory of vibrational echoes in harmonic oscillators. Signal exists only in the presence of quantum-number-dependent dephasing, providing unique information about interactions between vibrations and their surroundings.

T 4:30 Hartmut G. Roskos (Institut fiir Halbleitertechnik II, RWTH Aachen, Germany)

Ultrafast Coherent Solid State Phenomena

H. Roskos, C. Waschke, T. Dekorsy, P. Leisching, H. Auer, and H. Kurz

Coherent lattice vibrations and electronic wave packet oscillations such as Bloch oscillations can be initiated (and controlled) in semiconductors by excitation with femtosecond laser pulses. We review our recent results on the dynamics of such coherent phenomena studied by four-wave-mixing, electro-optic probing and THz-wave-emission spectroscopy.

T 5:00 Peter Thomas (Philipps- University Marburg, Germany)

Ultrafast Coherent Phenomena in Solids

P. Thomas and E. 0. Gobel

Quantum coherent phenomena in semiconductors can be induced and probed by ultrafast nonlinear optical excitation. We discuss quantum beats, Bloch oscillations and Rabi flopping in semiconductors and semiconductor heterostructures and photon echoes in disordered semiconductors.

T 5:30 Y.H. Zou (Peking University, Beijing, P.R. China)

Ultrafast Relaxation in Thin Films

Y. H. Zou, P. Yuan, S. B. Zhang, Z. J. Xia, L. Qiu, X. W. Zhou, J. F. Shen, Y. Lin, Y. Q. Shen, X. P. Li, H. J. Xu, and X. R. Xiao

The femtosecond nonlinear response of two kinds of thin films has been observed. In a pump-probe experiment, the relaxation mechanisms of a phthalocyanine LB film were identified. We have also recorded the time-resolved Kerr signals of a polymer (Flemion) film doped with nanometer-sized PbS cluster, from which we studied the femtosecond dephasing process. We found that the nonlinearity increased with the decrease of the cluster size.

WEDNESDAY, OCTOBER 12, 1994

MODIFIED SINGLE ATOM DECAY

Chung L. Tang, Presiding

W 8:30 (William) Ray Garrett (Oak Ridge National Laboratory, 1N)
Supression and Shifting of Certain Optically Pumped Stimulated Emissions Due to Wave-Mixing Interference
W. R. Garrell

It can be shown theoretically and easily demonstrated experimentally, that a certain subset of optically pumped stimulated emissions (OPSE) can show suppressed forward emission during the interval of a pump pulse, and large pressure dependent shifts at nonzero emission angles. Studies of stimulated emissions in alkali metal vapors and in noble gases are described, and the results are put into the underlying context of odd-photon interference phenomena.

W 9:00 Wolfgang A. Lange (Max-Plank-lnstitut ftir Quantenoptik, Garching, Germany)
Dynamic Modification of Atomic Decay in a Cavity
W. Lange and H. Walther

The interaction of Rydberg atoms and a single mode of a microwave cavity is strongly modified when the cavity is driven by an intense coherent field. For bichromatic driving, high order multiphoton transitions are dynamically shifted and enhanced by the cavity and observed as sharp resonances in the atomic decay rate.

W 9:30 Kazimierz Rzazewski (Center for Theoretical Physics and College of Science, Warsaw, Poland)
Radiating Coherent Atomic Wave-Packets
K. Rzazewski

We look again at the two fundamental processes discussed in quantum optics: resonant driving of a single atomic transition that leads to, so called, Rabi oscillations and at the most fundamental QED process of spontaneous emission. We look for the modification of these processes due to the coherence of the center of mass wave-function. The internal and external motions are coupled via recoil. The crucial role is played by the Doppler shift.

W 10:00 Ian A. Walmsley (University of Rochester, Rochester, NY)
Wave Packet Interference in Free Induction Decay from Molecules
I. A. Walmsley, J. N. Sweetser, and T. J. Dunn
The coherent emission from a molecule in a nonstationary vibrational state shows features associated with the interference of wave packets on different potential surfaces, and the effects of pulse propagation in a medium with time-dependent absorption and dispersion. The system can act as a temporally matched amplifier for specific seed pulses.

10:30- 11:00 :Coffee Break

TWO- LEVEL ATOMS

Paul Mandel, Presiding

W 11:00 Alexander E. Kaplan (The Johns Hopkins University, Baltimore, MD)
Novel Transient Effects in Two-Level Systems
A. E. Kaplan

We discuss three novel effects in two-level systems (TLS):
(i) Formation of sub-femtosecond pulses in multi-frequency mode-locked solitons in the cascade stimulated Raman scattering.
(ii) Super-dressed TLS: very high harmonic generation in a TLS driven by a field with a Rabi frequency much exceeding the TLS resonance frequency.
(iii) Modulation-induced transparency in a TLS when periodic modulation fully suppresses TLS dynamics. The system also exhibits a high-order frequency mixing with a plateau resulting in a soliton train.

W 11:30 Gautam Vemuri (Indiana University Purdue University Indianapolis, IN)
Two-Level Atoms in Non-Markovian Fields: Theory and Experiment
G. Vemuri

Some recent experimental and theoretical results on the response of two-level atoms in time-delayed, correlated, stochastic fields are discussed. An atom irradiated with time delayed fields sees the composite field as non-Markovian and hence the response is significantly different from that observed with Markovian fields. Results pertaining to four-wave mixing and absorption spectrum for two-level atoms will be presented.

12:00 - 1:00 : Lunch Break

POLARITONS

Joseph L. Birman, Presiding

W 1:00 Joseph L. Birman (City College of New York, New York)
Quantum Properties of Mixed Mode Polaritons: Stationary and Time-Dependent
J. L. Birman and M. Artoni

Mixed modes, i.e. coupled exciton and photon, and phonon and photon, offer novel and interesting opportunity to study tunable stationary and transient quantum-optic properties of solids, such as squeezing. Theory and proposed experiments will be presented.

W 1:30 Walter E. Bron (University of California, Irvine, CA)
Transient Coherent Polariton States and Anomalously Long Lived Acoustic Phonons
W. E. Bron

Transient ultrashort coherent excitation of polaritons in compound semiconductors is used to populate (through ultrafast relaxation) a transverse acoustic (TA) phonon near the X-point of the Brillouin zone. These phonons are shown to be anomalously long lived.

W 2:00 Fabrice Vallee (Ecole Polytechnique, Palaiseau, Fmnce)
Phonon-Polariton Pulse Transmission Through A Vacuum Layer
F. Vallee and Ch. Flytzanis

The transmission of a short phonon-polariton pulse through a vacuum layer separating two-identical noncentrosymmetric crystals (NH4Cl) is investigated by use of the non local time-resolved CARS technique. This technique yields information on the impact of an interface on the polariton wave-packet coherence.

COLOR CENTERS

Pavel P. Pashinin, Presiding

W 2:30 Neil B. Manson (Australian National University, Canberra, Australia)
Coherent Transients or Radiation - Dressed Atom Doublets at the Rabi Frequency
N. B. Manson, C. Wei and J. D.P. Martin

An EPR transition in a color center in diamond is driven at a Rabi frequency of few MHz and the transition at the Rabi frequency of a few MHz is detected using an optical Raman heterodyne technique. The transition is observed for CW and pulsed fields and various coherent transient effects are investigated.

W 3:00 Pavel P. Pashinin (General Physics Institute, Moscow, Russia)
F_2^- Color Centers Behavior in Strong Laser Fields
P. P. Pashinin

Experimental results of studies of F_2^- : LIF color centers bleaching in strong Nd-laser fields are presented. It occurs due to two-photon absorption from the excited state. The adsorption grating produced by this bleaching in the crystal has very strong influence on the laser pulse spectral width and polarization state of the output beam.

3:30 - 4:00 : Coffee Break

SUPERRADIANCE

Vyacheslav I. Yukalov, Presiding

W 4:00 Jasper Knoester (University of Groningen, The Netherlands)
Nonlinear Optical Response or Disordered Molecular Assemblies
J. Knoester

Assemblies of interacting molecules exhibit interesting collective optical phenomena, such as exciton superradiance and giant optical nonlinearities. These cooperative effects are counteracted by disorder. We discuss this competition and show that nonlinear spectroscopies may be used to obtain novel information about the microscopic nature of the disorder.

W 4:30 Jamal T. Manassah (City College of New York, New York)
Two and Three-Level Amplifiers in the Superradiant Regime
J. T. Manassah and B. Gross

In a two-level amplifier, the wing behavior of the output signal is shown to differ significantly for homogeneously and inhomogeneously broadened systems. In the later, 0-π may develop for large values of αL. In a three-level coherently prepared amplifier, scale invariance is broken leading to more complicated dynamics than for an incoherently prepared system.

W 5:00 Vitali V. Samartsev (Institute of Technical Physics, Kazan, The Russian Federation)
Optical Superradiance in Biphenyl Doped with Pyrene Molecules
V. V. Samartsev, S. N. Andrianov, Yu. E. Sheibut, P. V. Zinoviev, and N. V. Silaeva

Optical Superradiance (SR) is observed in mixed molecular crystal of biphenyl doped with pyrene ($^1B_{2u}$ - ^1Ag transition, A= 373.9nm, T=l.5 - 4.2 K). The principal pecularities of SR are investigated in this crystal. The theory of SR in solid is developed. This report is concerned with the promising field of coherent spectroscopy using optical superradiance.

W 5:30 Vyacheslav I. Yukalov (Joint Institute for Nuclear Research, Dubna, Russia and Queen's University, Kingston, Canada)
Transient Coherent Phenomena in Radiofrequency Region
V. I. Yukalov

The pecularities of transient coherent effects occuring in spin systems placed inside a resonator are considered. The following topics are discussed: observation of spin superradiance and resonator enhancement of spin echo in a system of nuclear spins, methods of solution of the Bloch equations, computer simulation of coherent effects in systems described by a microscopic model.

THURSDAY, OCTOBER 13, 1994

NEW LASERS

Lorenw M. Narducci, Presiding

Th 8:30 Fritz Haake (Universitat Gesamthochschule Essen, Gennany)
The Superradiance Laser: a New Collective Phenomena
F. Haake

N three-level atoms interacting with two cavity modes and subjected to pumping can superradiate stationarly. Intensity and linewidth then scale as N^2 and l/N^2, respectively; up to 100% of squeezing is possible. Spontaneous emission and pump fluctuation, perturb but do not destroy the noise reduction by coopemti vity.

Th 9:00 Lorenzo M. Narducci (Drexel University, Philadelphia, PA)
Exponential Gain and Self-Bunching in a Collective Atomic Recoil Laser (CARL)
R. Bonifacio, L. De Salvo, L. M. Narducci, and E. J. D'Angelo

We discuss the possibility of producing optical amplification with a collection of non-inverted two-level systems through a recoil-induced gain mechanism. The amplification is the result of an exponential instability and of the spatial self-bunching of the active atoms, reminiscent of the behavior of a free electron laser.

Th 9:30 Chung L. Tang (Cornell University, Ithaca, NY)
Broadly Tunable High-Repetition Rate Femtosecond Sources and Ultrafast Optical Correlation Spectroscopy
C.L. Tang

Recent Advances in the rapidly developing broadly tunable high-repetition rate femtosecond optical parametric sources will be reviewed. This will be followed by discussions of the use of optical correlation spectroscopy and upconversion to study coherent wave packet excitation and ultrafast relaxation dynamics in molecules and semiconductor quantum structures.

10:00 - 10:30 : Coffee Break

INDUCED TRANSPARENCY

Marian O. Scully, Presiding

Th 10:30 Joseph H. Eberly (University of Rochester, Rochester, NY)
Adiabatons - New Forms of Induced Transparency in Three-Level Media
J. H. Eberly and R. Grobe

Analytical and numerical solutions of two-photon pulse propagation show new stable pulse forms with the unusual property of arbitrary envelope shapes. Various properties of these "adiabatons" will be discussed.

Th 11:00 Stephen E. Harris (Stanford University, Stanford, CA)
Electromagnetically Induced Transparency and Matched Pulse Propagation
S. E. Harris

Matched pulses applied to an optically thick medium produce a population trapped state and thereby make the medium transparent. In turn, atoms in a population trapped state produce matched pulses. We describe several methods for achieving nearly lossless propagation.

Th 11:30 Marian O. Scully (Texas A&M University, College Station, TX & Max-Pianck-Institut für Quantenoptik, Garching, Germany)
Recent Advances in Experimental and Theoretical Studies of Lasing Without Inversion
M. O. Scully

Aspects of lasing without inversion (LWI) have been the subject of spirited debate. Analytical solutions are here presented which provide a useful tool for resolving many of the conundrums, provide new insights into the physics of the problem, and suggest new experiments.
Experimental results on LWI within the Na D-line will be presented. Furthermore, we have observed electromagnetically induced transparency in a V-system formed within both Na and Rb D_1/D_2 transitions.

12:00 - 1:00 : Lunch Break

LASING WITHOUT INVERSION

Stephen E. Harris, Presiding

Th 1:00 Paul Mandel (Universite Libre de Bruxelles, Belgium)
Coherent Phenomena and Lasing Without Inversion
P. Mandel

I shall review the mechanisms that lead to amplification without inversion in steady state and in the pulsed regime, considering semiclassical and quantum schemes. I shall focus on the status of the theory and its extension to electromagnetically induced transparency.

Th 1:30 Edward S. Fry (Texas A&M University, College Station, TX)
Lasing Without Inversion: Progress and Prognosis
E. S. Fry

Experiments which have been reported to demonstrate amplification by stimulated emission of radiation without population inversion will be reviewed. Proposals and efforts to build an actual laser oscillator based on lasing without inversion will be discussed. (or reviewed if they have already been successful).

Th 2:00 Gershon Kurizki (The Weizman Institute of Science, Rehovot, Israel)
Free-Electron Lasers Without Inversion
G. Kurizki, B. Sherman, D. E. Nikonov, and M. O. Scully

We present quantum and classical approaches to free-electron lasers without inversion in slow-wave structures, based on the Cherenkov or periodic-medium effects. The interference of absorption amplitudes in two sequential interaction regions result in absorption cancellation and enhanced gain, the process resembling lasing without inversion in atomic systems. Dispersive and focusing media between the two interaction regions can negate the effects of electron momentum spread. This opens a possibility for the realization of our scheme in the ultraviolet and X-ray regimes.

Th 2:30 Gunasiri G. Padmabandu (Houston Advanced Research Center, Texas Laser Laboratory, Woodlands, TX)
Atomic Coherence Effects Within the Na D_1 and D_2 Manifolds
G. G. Padmabandu, E. S. Fry, and M. 0. Scully

Experimental studies of atomic coherence effects and lasing without inversion within the sodium D_1 and D_2 manifolds are reviewed. The influence of relaxation and Doppler effects will be discussed.

Th 3:00 Alan D. Streater (Lehigh University, Bethlehem, PA)
Coherence Effect in Potassium Vapor
J. A. Kleinfeld and A. D. Streater

Steady state gain is observed in a potassium-helium mixture, for strong pumping near the D_2 line and probing near the D_1 line. The absorption/gain spectra are in good agreement with a four-level Raman driven model, where collisional transfer populates the probed excited state. The model predicts gain without bare state population inversion.

3:30- 4:00 : Coffee Break

DYNAMICS IN KERR MEDIA

Takayoshi Kobayashi, Presiding

Th 4:00 Takayoshi Kobayashi (University of Tokyo, Japan)
The Kramers-Kronig Relations in Transient Spectroscopy
T. Kobayashi, E. Tokunaga, and A. Terasaki

We have developed a new time-resolved femtosecond interferometric method to determine the real and imaginary part of the 3rd-order susceptibility, from which we could experimentally verify our theoretical predictions on the violation of the Kramers-Kronig (KK) relations in time-resolved spectroscopy. The KK relations, which result from the causality relation between the probe field and the probe polarization, are violated due to the presence of the pump field.

Th 4:30 Grover A. Swartzlander, Jr. (Worcester Polytechnic Institute, Worcester, MA)
Optical Vortex Solitons
G. A Swartzlander and C. T. Law

Optical vortex solitons are generated from phase singularities of the light field in a bulk self-defocusing medium. While sharing many of the properties of vortices in linear media and laser cavities, this soliton also induces a cylindrical refractive waveguide, allowing for example, dynamic optical interconnections. Such application potentials and our latest experimental and numerical results will be presented.

NEW PRODUCTS

Fred Moshary, Presiding

The presentations in this session have not been refereed. They are included as part of the general informational material to the Workshop's participants. All abstracts received from companies before a submission deadline are included.

Th 5:00 EXCEL/QUANTRONIX (Hauppauge, NY)
Recent Advances in Commercial Ti:S Amplifiers

With sub-100 fs pulsewidths and over 1 W average powers, Excel/Quantronix is at the forefront of kilohertz ultrafast amplifier commercialization. A single-grating design in the stretcher/compressor makes the system easily modifiable to produce transform-limited pulses from sub-100 fs to 5 ps width. Latest results on high power, short pulse amplification will be presented together with OPG/OPA data from UV to infrared.

Th 5:15 COHERENT Inc. (Santa Clam, CA)
Optical Parametric Amplification or the White-Light-Continuum Components at 250 kHz from Ti:Sapphire Regenerative Amplifier

A Ti:Sapphire mode-locked regenerative amplifier system pumped with a single ion laser is capable of producing 4 μJ, 170 fs pulses of 800nm wavelength at 250 kHz repetition rate. Part of this output is used to generate a high-beam-quality white-light continuum while the rest is doubled to 400 nm and used to parametrically amplify visible components of this continuum to more than 100 nJ. Synchronized with the visible signal pulse tunable from 450 to 700 nm is an infrared idler pulse tunable from 2.4 to 0.9 μm.

Th 5:30 POSITIVE LIGHT (Los Gatos, CA)
Wide Bandwidth Generation of Femtosecond Pulses

We report on the generation of tunable visible femtosecond laser pulses at kilohertyz repetition rates. The system is based on a parametric amplifier pumped by 100 fs pulses from a kHz Ti:sapphire CPA system (Merlin pumped Spitfire from Positive Light, seeded by a Spectra-Physics Tsunami system). Efficiency, tuning range and beam profiles will be presented.

Th 5:45 SPECTRA-PHYSICS LASERS Inc. (Mountain View, CA)
Beyond Mode-Locked Ti:Sapphire Lasers

We discuss recent extensions to the Ti:Sapphire laser technology. These include: (i) active stabilization of the Ti:Sapphire laser cavity to allow synchronization to external RF sources or other mode-locked lasers, (ii) regenerative amplifiers to provide over l mJ/pulse at kHz repetition rates, and (iii) a synchronously pumped optical parametric oscillator to generate tunable output from l.l to 2.6 microns and 550-700 nm through frequency doubling.

FRIDAY, OCTOBER 14, 1994

TRANSIENTS IN BIOLOGICAL SYSTEMS

Richard Meltzer, Presiding

F 9:00 Kiyoshi Uchikawa (Nikon Tsukuba Research Laboratory, Japan)
Photon Echo Spectroscopy for Biological Systems
K. Uchikawa, T. Suga, and A. Furusawa

Accumulated photon echo decay measurements were performed for biological systems. The cancer t1ssues showed larger decay rates than the corresponding normal tissues. The decay rate of cultured cells was changed by the reaction with antinuclear antibodies. The applicability of photon-echo spectroscopy to biological studies is pointed out.

F 9:30 Alexander O. Ganago (Cornell University, Ithaca, NY)
Femtosecond Dynamics or Population and Coherence or Bacteriochlorophyll Q_x excited state in vivo and in vitro
A. O. Ganago, E. P. Parker, A. C. Albrecht, and T. G. Owens

Population relaxation and electronic dephasing of bacteriochlorophyll a Q excited state in solutions, in photosynthetic reaction centers and light-harvesting complexes were measured using four-wave-mixing spectroscopy. The calculated homogeneous linewidth is much smaller than FWHM. The possible role of ultrafast dephasing in photosynthesis is discussed.

10:00 - 10:30 : Coffee Break

MEMORY DEVICES

Vitali V. Samartsev, Presiding

F 10:30 R. L. Cone (Montana State University, Bozeman, MT)
Ultra-slow Dephasing and Dephasing Mechanisms in Rare Earth Materials for Optical Data Storage
R. L. Cone, R. W. Equall, Y. Sun, and R. M. Macfarlane
Measurement of an optical dephasing time of 2.6 msec for Eu^{3+}:Y_2SiO_5 corresponds to an optical resonance width of 122 Hz or $Q > 4 \times 10^{12}$. Optical dephasing mechanisms are discussed from the perspective of applications to time domain optical storage and signal processing and to sensitive probing of small interactions in solids.

F 11:00 Masaharu Mitsunaga (NTf Basic Research Laboratories, Kanagawa, Japan)

Temporal and Spectral Optical Information Storage by Rare-Earth Ions in Crystals

M. Mitsunaga

Crystals doped with Eu ions are among the best candidates for high density temporal and spectral optical information storage, since they show KHz-wide homogeneous widths, persistent hole lifetimes and so on. We will show some of these applications including stimulated photon-echo memory and holographic motion picture.

F 11:30 Valery M. Yermachenko (Moscow Engineering Physics Institute, Russia)

Recording, Storage and Reproduction of Information by Means of Photon Echo

V. M. Yermachenko and I. V. Yevseyev

Theoretical and experimental developments in the area of photon echo applied to various techniques of information recording, storage and reproduction are reviewed and discussed. The conditions for high quality recording, storage and reproduction of the information pulse by means of the ordinary photon echo or the modified photon echo are formulated.

12:00 - 1:00 : Lunch Break

GENERAL NONLINEAR OPTICS

Igor Yevseyev, Presiding

F 1:00 Mark Bashkansky (Naval Research Laboratory, Washington, DC)

Spectral and Spatial Characteristics or Optically Pumped Cascade Emissions in Na Vapor

M. Bashkansky, P. Battle, R. Mahon, and J. Reintjes

We present experimental results of spectral and spatial properties of the laser-pumped cascade emissions from sodium vapor when the 3S-4P transition in sodium is excited with resonant 330 nm narrowband radiation. We observe a pronounced conical emission in only the lowest cascade transition. We discuss possible origins of this effect.

F 1:15 I. S. Bikbov (Mari State University, Ioshkar-Oia, Russia)

Polarization Properties or Photon Echoes in Molecular Iodine and its Spectroscopic Applications

I. I. Popov, I. S. Bikbov, I. V. Yevseyev and V. V. Samartsev

Polarization peculiarities of photon echoes in molecular iodine are analyzed in details. The associative properties of photon echoes are observed and their applications to storage technology are considered. The results of polarization spectroscopy of molecular iodine are also reported.

F 1:30 Tian-Jie Chen (Southern Illinois University, Carbondale, IL)
Second Harmonic Generation in the Vacuum Ultraviolet Region by Nonlinear Optical Crystals
T-J. Chen, R. Ziuer, and R. Tao

In the VUV region, nonlinear optical crystals may have a high nonlinear susceptibility. Phase-matching condition can be satisfied in a layer IOOA thick, thus leading to appreciable second harmonic generation. When the double resonance is reached, the conversion efficiency can be as high as a few tenths. The preferred design is a reflection configuration.

F 1:45 Mikhail V. Fedorov (General Physics Institute, Moscow, Russia)
Emission of Light by an Electron Detached from the Atom by a Very Strong Laser Field.
M. V. Fedorov

Ionization of an atom by a very strong laser field is considered in the framework of the Barrier-Suppression-Ionization and Wave-Packet-Spreading models. Collisions of the detached electron with its parent ion are taken into account as the first order corrections to the free motion that includes classical oscillations and quantum mechanical spreading. The average first-order dipole acceleration is found and is used to determine the emission spectrum.

F 2:00 Barry Gross (City College of New York, New York)
Modification of Noisy Fields Propagating in Two-Level Media
J. T. Manassah and G. Gross

We study the deviation from stationarity and Gaussian statistics of an incoming stationary Gaussian field propagating in dense two-level media. In the linear regime, the modifications are described by a shortening of the field correlation-time. In the nonlinear regime, the field and the atomic polarizability correlation functions show non-stationary and non-Gaussian statistics.

F 2:15 Fred Moshary (City College of New York, New York)
Incoherent Time-Delayed Four-Wave-Mixing Spectroscopy of Nile Blue in Solutions, Polymers, and Organic Glasses
Y. Zhang, F. Moshary, and S. R. Hartmann

The excitation dynamics and relaxation characteristics of Nile Blue in various solvents is studied, using the time-delayed four wave-mixing technique, at ambient and cryogenic temperatures over its absorption line-width. The roles of electronic, vibrational, and phonon side-band in the observed decay characteristics of the signal are discussed.

F 2:30 Leonid S. Vasilenko (Institute of Semiconductor Physics, Novosibirsk)
Transient Coherent Spectroscopy or High Resolution
L. S. Vasilenko and N. N. Rubtsova

Coherent transient techniques, able to eliminate Doppler broadening of spectral lines, are applied to high resolution spectroscopy. Experimental results are presented on high resolution spectroscopy (to better than several KHz) in C02 laser excited molecular gas SF6. obtained using two such techniques: 1) resonant coherent transients, and 2) coherent radiation in time separated fields.

F 2:45 Steven R. Wilkinson (Sandia National Laboratories, Albuquerque, NM)
Observation or Gain Without Inversion Using Nanosecond Pulses
S. R. Wilkinson, A. V. Smith, M. 0. Scully, and E. S. Fry

We show that gain without inversion is possible using nanosecond laser pulses. A time-dependent coherence between energy levels can be established fast compared to the decay of the upper excited levels. We derive a relationship between the pulse width and the splitting of the energy levels and show there exist two distinct types of transient systems. Numerical modeling and experimental verification are currently in progress.

F 3:00 Vitali V. Samartsev (Institute of Technical Physics, Kazan, The Russian Federation)
Photon Echo in LaF3: Pr3+ Excited by a Magnetic Field Pulse Prior to the Laser Excitations
A.M. Shegeda, V. A. Zuikov, B. M. Khabibullin, V. N. Lisin, and V. V. Samartsev

The change in the amplitude of the coherent emission from a system of Pr3+ impurity centers in LaF3 caused by nonequilibrium terahertz phonons has been investigated both experimentally and theoretically.

Alphabetical List of Speakers

• **A. C. Albrecht** (Cornell University): "Ultrasharp Spectra and Ultrafast Timing from Noisy Coherence in Four-Wave-Mixing". *M 1:00*.
• (Naval Research Lab.): "Spectral and Spatial Characteristics of Optically Pumped Cascade Emissions in Na Vapor". *F 1:00*.
• **M. A. Berg** (University of South Carolina): "Raman Echoes on Vibrations in Liquids" *M 4:00*.
• **I. S. Bikbo**v (Mari State University, loshkar-Ola): "Polarization Properties of Photon Echoes in Molecular Iodine and its Spectroscopic Applications". *F 1:15*.
• **J.L. Birman** (City College of New York): "Quantum Properties of Mixed Mode Polaritons: Stationary and Time Dependent". *W 1:00*.
• **W.E. Bron** (Univ. of California- Irvine): "Transient Coherent Polariton States and Anomalously Long-Lived Acoustic Phonons". *W 1:30*.
• **T .J. Chen** (Southern Illinois University): "Generation of Second Harmonic in the Vacuum Ultraviolet Region by Nonlinear Optical Crystals". *F 1:30*.
• **R. L. Cone** (Montana State University): "Ultraslow Dephasing and Dephasing Mechanisms in Rare Earth Materials for Optical Data Storage". *F 10:30*.
• **J. H. Eberly** (University of Rochester): "Adiabatons - New Forms of Induced Transparency in Three-Level Media". Th *10:30*.
• **K. B. Eisenthal** (Columbia University): "Chemical Dynamics at Liquid Interfaces". T *11:00*.
• **M. D. Fayer** (Stanford University): "Vibrational Dynamics of Liquids and Glasses Probed with IR Photon Echoes". *M 4:30*.
• **M. V. Fedorov** (General Physics Institute, Moscow) Emission of Light by an Electron Detached from the Atom by a Very Strong Laser Field". *F 1:45*.
• **G. R. Fleming** (University of Chicago): "Nonlinear Optical Studies of Chemical Dynamics in Solution". *T 9:30*.
• **J.T. Fourkas** (Min: "Dephasing-lnduced Phenomena in Nonlinear Vibrational Experiments". *T 4:00*.
• **E. S. Fry** (Texas A&M University): "Lasing Without Inversion: Progress and Prognosis". *Th 1:30*.
• **A. O. Ganago** (Cornell University): "Femtosecond Dynamics of Population and Coherence of Bacteriochlorophyll Qx Excited State in vivo and in vitro". *F 9:30*.
• **W. R. Garrett** (Oak Ridge National Lab.): "Suppression and Shifting of Certain Optically Pumped Stimulated Emissions Due to Wave-Mixing Interference". *W 8:30*.
• **G. Gerber** (Albert-Ludwigs-Universitat Freiburg): "Ultrafast Phenomena in Molecules and Cluster". *T 11:30*.
• **B. Gross** (City College of New York): "Modification of Noisy Fields Propagating in Two-Level Media". *F 2:00*.
• **F. Haake** (Universitat Gesamthochschule Essen): "The Superradiance Laser: a New Collective Phenomenon". *Th 8:30*.
• **S. E. Harris** (Stanford University): "Electromagnetically Induced Transparency and Matched Pulse Propagation". *Th 11:00*.

• **S. R. Hartmann** (Columbia University): "Coherence Inihibition in Cascade Auorecence". *M 10:40*.
• **A. E. Kaplan** (Johns Hopkins University): "New Transient Phenomena in Two-Level Model". *W 11:00*.
• **J. Knoester** (University of Groningen): "Nonlinear Optical Response of Disordered Molecular Assemblies". *W 4:00*.
• **T. Kobayashi** (University of Tokyo): "The Kramers-Kronig Relations in Transient Spectroscopy". *Th 4:00*.
• **J. Kuhl** (Max-Pianck-Institut für Festkoerperforschung): "Transient Degenerate-Four-Wave-Mixing on Exciton in GaAs Quantum Wells". *T 1:00*.
• **G. Kurizki** (Weizmann Institute): "Free Electron Lasers Without Inversion". *Th 2:00*.
• **W.A. Lange** (Max-Pianck-Institut fiir Quantenoptik): "Dynamic Modification of Atomic Decay in a Cavity". *W 9:00*.
• **R. M. Macfarlane** (IBM - Almaden): "Photon Echoes in Rare Earth Doped Solids: A Material Perspective". *M 1:30*.
• **J. T. Manassah** (City College of New York): "Two- and Three-Level Amplifiers in the Superradiant Regime". *W 4:30*.
• **P. Mandel** (Universite Libre de Bruxelles): "Coherent Phenomena and Lasing without Inversion". *Th 1:00*.
• **N. Manson** (Australian National University): "Coherent Transients of Radiation- Dressed Atom Doublets at the Rabi Frequency". *W 2:30*.
• **R. S. Meltzer** (University of Georgia): "Electric Field-Modulated Photon Echo: Application to Photo-Induced Electric Domains in Ruby". *M 2:00*.
• **M. Mitsunaga** (NTT Basic Research Lab.): "Temporal and Spectral Optical Information Stomge by Rare-Earth Ions in Crystals". *F 11:00*.
• **F. Moshary** (City College of New York): "Incoherent Time-Delayed Four-Wave-Mixing Spectroscopy of Nile Blue in Solutions, Polymers and Organic Glasses". *F 2:15*.
• **L. M. Narducci** (Drexel University): "Exponential Gain and Self-Bunching in a Collective Atomic Recoil Laser (CARL)". *Th 9:00*.
• **A. Nitzan** (Tel-Aviv University): "Solvation Dynamics: Linear and Nonlinear Response". *T 10:00*.
• **A. V. Nurmikko** (Brown University): "The Role of Electron-Hole Pair Correlations in Blue-Green Semiconductor Quantum Well Lasers". *T 1:30*.
• **M. Orrit** (University of Bordeaux): "Investigation of Spectral Diffusion in Disordered Solids by Single Molecule Spectroscopy". *T 8:30*.
• **G. Padmabandu** (Texas Laser Laboratory, HARC): "Atomic Coherence Effects Within the Sodium $D_1$and D_2 Manifolds". *Th 2:30*.
• **P. P. Pashinin** (General Physics Institute, Moscow):"~- Color Centers Behavior in Strong Laser Fields". *W 3:00*.
• **K.A. Prokhorov** (General Physics Institute, Moscow): "Some Aspects of Resonant Hyper-Raman Spectroscopy of Semiconductors". *T 2:00*.
• **H. Roskos** (lnstitut fiir Halbleitertechnik, Aachen): "Ultrafast Coherent Solid State Phenomena". *T 4:30*.

• **N. N. Rubtsova** (Inst. of Semiconductor Physics, Novosibirsk): "Intensity Dependence of Photon Echo Kinetics in Molecular Gas". *M 3:00*.
• **A. G. Rudavets** (Inst. of Energy Problems of Chemical Physics, Moscow Region): "Photon Echoes of Pulsed Photodissociation Via Photoinduced Harpoon Reactions". *M 3:15*.
• **K. Rzazewski** (Center for Theoretical Physics, Warsaw): "Radiating Coherent Atomic Wave-Packets". *W 9:30*.
• **V. V. Samartsev** (Inst. of Technical Physics, Kazan): "Optical Superradiance in Biphenyl Doped with Pyrene Molecules". *W 5:00*.
• **M. O. Scully** (Texas A&M and Max-Plank Inst.): "Recent Advances in Experimental and Theoretical Studies of Lasing Without Inversion". *Th 11:30*.
• **C. V. Shank** (Lawrence Berkeley Lab.): "Femtosecond Photon Echo Experiments on Molecules in Liquids". *M 5:00*.
• **J. L. Skinner** (University of Wisconsin): 'Probing the Dynamics of Disordered Crystals: Spectral Diffusion oflndividual Molecules". *T 9:00*.
• **D. G. Steel** (University of Michigan): "Coherence Nonlinear Optical Phenomena ofExcitons in Semiconductors". *T 2:30*.
• **A. D. Streater** (Lehigh University): "Coherence Effects inK Vapors". *Th 3:00*.
• **G. A. Swartzlander**, Jr. (Worcester Polytechnic Institute): "Optical Vortex Solitons". *Th 4:30*.
• **C. L. Tang** (Cornell University): "Broadly Tunable High Repetition Rate Femtosecond Sources and Ultrafast Optical Correlation Spectroscopy". *Th 9:30*.
• **P. Thomas** (Philipps-Universitat Marburg): "Ultrafast Coherent Phenomena in Solids". *T 5:00*.
• **K. Uchikawa** (Nikon Tsukuba Research Lab.): "Photon Echo Spectroscopy for Biological Systems". *F 9:00*.
• **F. Vallée** (Ecole Polytechnique, Palaiseau): "Phonon-Polariton Pulse Transmission Through Vacuum Layer". *W 2:00*.
• **L. S. Vasilenko** (Inst. of Semiconductor Physics, Novosibirsk): "Transient Coherent Spectroscopy of High Resolution". *F 2:30*.
• **G. Vemuri** (IUPUI, Indianapolis): "Two-Level Atoms in Non-Markovian Fields: Theory and Experiment". *W 11:30*.
• **I. A. Walmsley** (University of Rochester): "Wave Packet Interference in Free ~nduced Decay from Molecules". *W 10:00*.
• **D. A. Wiersma** (University of Groningen): "Photon Echoes in Disordered Condensed PhaSe Systems. *M 5:30*.
• **S. R. Wilkinson** (Sandia National Lab.): "Observation of Gain Without Inversion Using Nanosecond Pulses". *F 2:45*.
• **M. Woerner** (Max-Born-Institut, Berlin): "Relaxation Phenomena in Semiconductors". *T 3:00*.
• **V. M. Yermacbenko** (Moscow Engineering Physics Institute): "Recording, Storage and Reproduction of Information by Means of Photon Echo". *F 11:30*.
• **I. V. Yevseyev** (Moscow Engineering Physics Institute): "Long-Lived Modified Stimulated Photon Echo". *M 2:30*.
• **V. I. Yukalov** (Joint Institute for Nuclear Research, Dubna): "Transient Coherent Phenomena in Radiofrequency Region". *W 5:30*.

• **A. H. Zewail** (California Institute of Technology): "Ultrafast Coherence Phenomena from Nano to Femtosecond Resolution". *M 11:10*.
• **Y .H. Zou** (Peking University): "Ultrafast Relaxation in Thin Films". *T 5:30*.

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