

CONTENTS

FOREWORD	XIII
CONFERENCE COMMITTEE	XV
KEYNOTE ADDRESS	
Laser Fusion <i>Edward Teller</i>	1
HIGH ENERGY LASERS AND APPLICATIONS	
Production Of XeF(B) By Nuclear Pumping <i>G. H. Miley, S. J. S. Nagalingam, F. P. Boody, and M. A. Prelas</i>	5
Formation, Quenching, And Absorption Processes In Self-Sustained Discharge Pumped XeF Lasers <i>L. E. Kline, L. J. Denes, S. G. Leslie, and R. R. Mitchell</i>	14
Intense Proton Beam Pumped Gas Lasers <i>J. Golden, J. G. Eden, R. A. Mahaffey, J. A. Pasour, and R. W. Waynant</i>	18
Advanced Lasers For Fusion Applications <i>W. F. Krupke (Invited)</i>	24
A Hydrogen-Fluoride Laser Conceptual Design For Laser Fusion <i>G. W. Cooper</i>	31
LIDAR AND OTHER APPLICATIONS	
Applications Of Lidar To Atmospheric Sensing <i>V. E. Derr (Invited)</i>	40
Theoretical Characterization Of Bottom Returns For Bathymetric Lidar <i>R. W. Thomas and G. C. Guenther</i>	48
Blue-Green Lasers For Air To Water Applications <i>R. F. Lutomirski</i>	60
Grazing Angle Lidar For Detection Of Shallow Submerged Objects <i>R. D. Anderson, R. F. Howarth, and G. C. Mooradian</i>	68
An Advanced Aircraft Compatible Laser Induced Fluorescence System: In-Situ Measurements Of Atmospheric Trace Gases <i>D. D. Davis, D. Philen and M. Rodgers</i>	78
Large Giant Laser Pulse Energy And Power Densities Through Optical Fibers <i>M. J. Landry</i>	80
Tablaser - A New Concept For Trace Element Laser Microprobe <i>R. M. Measures and H. S. Kwong</i>	88
FAR INFRARED/SUBMILLIMETER LASERS AND APPLICATIONS	
Hyper-Raman Scattering And Related Phenomena <i>P. D. Coleman (Invited)</i>	93
Nonlinear Radiation And Life-The Human Breath As A Low Intensity Gasdynamic Laser <i>P. S. Callahan (Invited)</i>	99
Picosecond Far Infrared Pulses: Some Approaches <i>T. A. DeTemple</i>	104
Stimulated Backscattering From An Electron Beam In A Dielectric Resonator <i>J. E. Walsh, and G. Crew</i>	111
Coherent Far IR Radiation From A Line-Focus Plasma <i>J. G. Kepros</i>	116

Characteristics Of Non-Diffusion-Limited Optically Pumped CW Lasers - Experimental Results for CH ₂ F ₂ <i>T. A. Galantowicz, E. J. Danielwicz, F. B. Foote, and D. T. Hodges</i>	121
Direct Mixing At 311 μm In Point Contact Diodes <i>P. J. Epton, W. L. Wilson, F. K. Tittel and T. A. Rabson</i>	126
A Submillimeter Wave Transmitter/Receiver System <i>R. W. McMillan, M. J. Sinclair, J. H. Rainwater, E. A. Pickew, G. R. Loefer, J. J. Gallagher, R. G. Shackelford, and G. T. Wrixon</i>	130
Tunable Kilowatt ¹² CH ₃ F-Laser Emission From An Unstable Resonator <i>B. A. Weber, G. J. Simonis, and S. M. Kulpa</i>	137
SOLID STATE AND METAL VAPOR LASERS	
High-Energy, TEM ₀₀ -Mode Nd:YAG Oscillators <i>R. M. Kogan and R. E. McKinney</i>	142
Ultrashort Pulse Solid-State Transmitter Development <i>L. L. Harper, R. H. Williams, E. K. Logan and D. A. Stevens</i>	147
Laser Infrared Materials Research Program <i>S. C. Seitel, E. A. Teppo, and D. W. Ricks</i>	155
Emission Cross Section And Flashlamp-Excited NdP ₅₀₁₄ Laser At 1.32 μm <i>M. M. Choy, W. K. Zwicker and S. R. Chinn</i>	163
Energy Levels and Laser Action In Nd:CaY ₂ Mg ₂ Ge ₃ O ₁₂ <i>A. W. Tucker and M. Birnbaum</i>	168
Stimulated Emission At 2.8 μm in Er ³⁺ :YLF <i>E. P. Chicklis, L. Esterowitz, R. Allen and M. Krueer</i>	172
Multiple-Wavelength Solid-State Laser <i>R. E. McKinney and R. M. Kogan</i>	179
Recent Advances In Metal Vapor Lasers <i>J. A. Piper (Invited)</i>	185
Use of Volatile Metal Compounds For Operation Of CW Metal Ion Lasers <i>J. A. Piper</i>	194
Optimum Laser Energy And The Interpulse Afterglow In A Cu/CuCl ₂ Double Pulse Laser <i>M. J. Kushner and F. E. C. Culick</i>	198
LASER CHEMISTRY AND SPECTROSCOPY	
Photodissociation And Photofragmentation Spectroscopy Of Molecular Ions <i>J. T. Moseley (Invited)</i>	207
Two Laser Study Of The Dynamics Of The O(¹ D) + H ₂ Reaction <i>G. K. Smith, J. E. Butler, and M. C. Lin</i>	215
Effects Of Laser Radiation On Heterogeneous Reactions In Static And Flow Systems <i>D. E. Tevault, M. E. Umstead, and M. C. Lin</i>	219
Study Of Complex Chemical Equilibria Using Laser Raman Techniques <i>G. L. Workman, J. Zwiener, and M. Davidson</i>	224
The Laser pH Jump <i>A. J. Campillo, J. H. Clark, R. C. Hyer, S. L. Shapiro, K. R. Winn and P. K. Woodbridge (Invited)</i>	232
Stimulated Emission Spectroscopy With An Optically Pumped I ₂ Laser <i>J. B. Koffend, R. Bacis, and R. W. Field (Invited)</i>	240
Stork and Heterodyne Diode Laser Spectroscopy of Methyl Alcohol <i>J. P. Sattler, W. A. Riessler, and T. L. Worchesky (Invited)</i>	252
Multi-Photon Excitation And Emission From Europium Ions In Aqueous Solution <i>J. F. Giuliani</i>	258

Pulsed Tunable Dye Lasers in Plasma Diagnostics <i>W. A. Fitzsimmons</i>	263
---	-----

MATERIALS AND INTERACTIONS

Influence of Laser Pulse Shape on Metal Mirror Damage <i>H. M. Musal, Jr.</i>	267
Reflectance Change Of A Copper Surface During Intense Laser Irradiation <i>K. Park and W. T. Walter</i>	274
Methodology For Designing High-Energy Laser Windows <i>C. A. Klein</i>	283
Applications That Utilize The Observables Produce By High-Energy Laser Interactions With Targets <i>V. R. Stull</i>	296
Kinetic Theory Of Metal Evaporation Front <i>M. Newstein, N. Solimene and J. Hammer</i>	307
Theory Of Optical Ray Retracing In Laser-Plasma <i>R. H. Lehmborg and B. H. Ripin</i>	313
Propagation Of Charged Particles In Laser Beams With Parabolic Intensity Profiles: A New Approach To Isotope Separation <i>A. K. Ghatak and J. L. Hughes</i>	322
Requirements For Optical Travelling Wave Excitation Of Line Plasmas For X-Ray Laser Research <i>R. Mavaddat, A. K. Ghatak, and J. L. Hughes</i>	326
Inhomogeneously Pumped Stimulated Raman Scattering <i>D. Eimerl</i>	333
Plasma Channel Formation By Laser Ionization Based on Resonance Saturation - LIBORS <i>R. M. Measures, N. Drewell and P. Cardinal</i>	339

LASERS AND OPTICAL COMMUNICATIONS

Optimum System Design For Optical Satellite To Submarine Communication Links <i>C. Ciany, G. Schroeder, and G. Lee</i>	343
Millimeter Wave And Laser Satellite Communication System Comparison <i>F. E. Goodwin and R. T. Luice</i>	349
Recent Developments In Discharge-Excited Rare Gas Halide Lasers <i>C. P. Christensen and N. Djeu (Invited)</i>	361
Gain And Saturation Of The Nitrogen Ion Laser <i>C. B. Collins, J. M. Carroll, and K. N. Taylor</i>	363
Characteristics Of High-Power Photopreionization-Stabilized UV Nitrogen Lasers Operating At Gas Pressures Of Up To 6 Atmospheres <i>H. M. Von Bergmann, V. Hasson and D. J. Brink</i>	370
Improved Dissociation Efficiency in TE Pulsed Copper Halide Lasers <i>M. Brandt and J. A. Piper</i>	380

INTEGRATED AND FIBER OPTIC DEVICES

Fabrication and Testing Of A Three-Channel Integrated Optical Data Preprocessor <i>C. M. Verber, D. W. Vahey and R. P. Kenan</i>	386
Integrated Optic (Bragg) Spectrum Analyzer <i>M. K. Baronoski, B. Chen, H. M. Gerard, E. Marom, O. G. Ramer, W. R. Smith, Jr., G. L. Tansonan, and R. D. Weglein</i>	392
Incoherent Emission From Single Mode, Single Frequency GaAlAs Laser Diodes <i>R. R. Rice, L. B. Allen, and D. G. Hall</i>	398

Å High Sensitivity Laser Vibration Meter Using A Fibre Optic Probe <i>F. Parmigiani</i>	405
Application of Lasers to Measuring Food Quality <i>G. S. Birth</i>	407
DEVICES, TECHNIQUES, AND THEORY	
Semiclassical Analysis Of Cooperative Effects And Fluctuations In Optical Bistability <i>A. Zardecki and R. Baribeau</i>	411
High-Speed-Laser-Detectors <i>H. Sonnenberg</i>	416
Analytic Approaches To Unstable Optical Resonators <i>J. Nagel, D. Rogovin, P. Avizonis, and R. Butts</i>	421
Active/Passive Scanning <i>J. R. Woodfill and F. J. Thomson</i>	442
Laser Transponders For Ranging To Near And Distant Targets <i>J. L. Hughes</i>	450
Minature Flowing Gas Systems For Lasers <i>H. L. Pratt</i>	456
CO ₂ LASERS AND APPLICATIONS	
Miniatured 10-Micron Lasers <i>H. W. Mocker and R. G. Buser (Invited)</i>	462
Design, Construction And Performance Of A 300 W CW CO ₂ Laser <i>R. K. Mosavi</i>	463
A CO ₂ Laser For A Compact Imaging Radar <i>S. Marcus and J. W. Caunt</i>	464
Enhanced CO ₂ Laser Operation Using D ₂ O Additive <i>A. Papayouanou and C. Bickart</i>	469
Detailed Gain And Energy Extraction Measurements in CO ₂ Waveguide Lasers Operating At Pressures Of Up To 15 Atmospheres <i>D. J. Brink, V. Hasson and H. M. Von Bergmann</i>	476
Axially Pulsed CO ₂ Waveguide Lasers <i>A. Papayouanou and H. Mocker</i>	486
A High-Power (~10 GW), Short-Pulse (≤ 1-ns) CO ₂ TEA Amplifier <i>S. J. Czuchlewski, E. J. McIellan, J. F. Figueira, E. Foley, C. E. Knapp and J. A. Webb</i>	498
Resonant Phenomena in Millimeter-Wave Modulation of CO ₂ Lasers <i>E. Bonek and G. Magerl (Invited)</i>	506
A New 10.6 μm Saturable Absorber: KCl Doped With KReO ₄ <i>R. K. Ahrenkiel, D. Dunlavy and J. F. Figueira</i>	513
Stark Cell Control Of 10 μm Lasers <i>D. M. Henderson and S. M. Fry</i>	520
PHASE CONJUGATION AND ADAPTIVE OPTICS	
Observation Of Infrared Phase Conjugation In Molecular Gases <i>D. Depatie, D. Haueisen, A. Elci, and D. Rogovin</i>	525
High Efficiency Phas-Conjugate Reflection In Germanium And In Inverted CO ₂ <i>I. J. Bigio, B. J. Feldman, R. A. Fisher, and E. E. Bergmann</i>	531
Large Signal Characteristics Of Phase Conjugate Back Scatterings <i>H. Hsu</i>	538

Applications Of Nonlinear Phase Conjugation In Compensated Active Imaging <i>T. R. O'Meara</i>	542
Effects Of Wind And Finite Bandwidth On Adaptive Phase Compensation Of Atmospheric Turbulence <i>J. Y. Wang</i>	554
OPTICAL DATA PROCESSING	
Coherent Optical Pattern Recognition <i>H. J. Caulfield and D. Casasent</i>	564
Light Valve Signal Processing <i>M. L. Noble</i>	574
Optical Feedback For Stable States <i>S. A. Collins, Jr., U. K. Sengupta, and U. H. Gerlach</i>	579
Real Time Optical Vehicle Identification And Tracking <i>B. D. Guenther, C. R. Christensen, and J. Upatnieks</i>	587
Coherent Optical Processing For Missile Guidance <i>G. Calderone, A. Reich, J. Connelly, and M. Ginsberg</i>	595
PROPAGATION	
New Models Of The Refractive-Index Spectra In Turbulent Media And Predictions For Laser Propagation <i>R. J. Hill</i>	602
Atmospheric Attenuation Measurements Of Submillimeter Waves <i>W. L. Gamble, J. F. Osmundsen, H. C. Meyer and G. A. Tanton</i>	606
Vibrational Deactivation Of Nitrogen By Water Vapor <i>J. Nagel and D. Rogovin</i>	610
Geometry Dependence of Optical Pulse Broadening In Multiple Scattering Media <i>R. W. L. Thomas and A. C. Holland</i>	617
Description Of Optically Relevant Turbulence Parameters <i>K. L. Davidson, C. Fairall, T. Houlihan, G. Schacher, and D. Hinsman</i>	625
Thermal Blooming Of High Energy Laser Beams <i>C. B. Hogge</i>	633
INTERFEROMETRIC EFFECTS	
Object Detectability In Speckle Noise <i>C. R. Christensen, B. D. Guenther, J. S. Bennett, N. Jain, N. George, and A. Kozma</i>	637
A Laser Interferometer For The Measurement Of Electron Densities <i>C. M. Robertson and C. E. Maloney</i>	646
A Time-Scanned Interferometer Using Photographic Diffusers <i>C. P. Grover and H. M. Van Driel</i>	650
Statistical Properties Of Liquid Surfaces With Transient Random Deformations Induced By Projected Speckle Patterns <i>G. Da Costa</i>	655
Surface Roughness Measurement By Means Of Speckle Wavelength Decorrelation <i>M. Giglio, S. Musazzi, and U. Perini</i>	663
Holographic Nondestructive Inspection At 10.6 μm <i>M. Blanchard, M. Cormier, R. Beaulieu and M. Rioux</i>	666
Pulsed Holographic Interferometry Of Objects Subject To Both Uniform And Vibrational Motion <i>S. C. Gustafson</i>	673

INVITED PAPERS ON MISCELLANEOUS TOPICS

Techniques For Rapid Laser Induced Energy Transfer Using Metastable States <i>S. E. Harris and J. F. Young (Invited)</i>	679
Laser Excitation Of Inner-Shell Atomic States By Multiquantum Amplitudes <i>C. K. Rhodes (Invited)</i>	689
Optically Pumped Dimer Lasers <i>B. Wellegehausen (Invited)</i>	690
Color Center Lasers <i>G. Litfin (Invited)</i>	691
An Efficient High Power CW UV-Visible And Infrared Tunable Free Electron Laser Using Low Energy Electron Beams <i>L. R. Elias, J. M. J. Madey, and T. I. Smith (Invited)</i>	695
Laser Beam-A New Microsurgical Instrument <i>P. W. Ascher, F. Heppner, R. W. Oberbauer, G. F. Walter, and E. Ingolitsch (Invited)</i>	696
Infrared Heterodyne Spectroscopy For Astrophysical Applications <i>M. J. Mumma (Invited)</i>	700
Laser Applications To Chemical Kinetics <i>P. H. Wine, A. R. Ravishankara, D. L. Philen, and F. P. Tully (Invited)</i>	707
Inverse Problems In Optics <i>H. P. Baltes (Invited)</i>	716
Trends in Holography <i>E. N. Leith (Invited)</i>	723
Absorptive Optical Bistability <i>L. M. Narducci, J. D. Farina, and L. Benza (Invited)</i>	728
POSTDEADLINE PAPERS	
The High-Power Nd:YAG Laser Blade Scalpel For Hemostatic Surgery <i>D. Auth, J. Hill, D. Heimbach, M. Durtschi, R. Wentworth, and M. Howard</i>	738
Transverse RF Excitation For Waveguide Lasers <i>K. D. Laakmann</i>	741
Low-Power Pulsed CO ₂ Lasers For Beamrider Applications <i>C. J. Bushnell</i>	744
An Analysis Of Noise Limitations In Laser Fiber Gyro Configurations <i>D. G. Hall and R. R. Rice</i>	753
Wavetank Measurements Of Wind Driven Capillary Waves <i>L. C. Bobb, G. Ferguson and M. Rankin</i>	761
Laser Generated Ultrasonic Waves <i>J. R. M. Viertel</i>	763
A New Blue Green Excimer Laser In XeF <i>W. K. Bischel, H. H. Nakano, D. J. Eckstrom, R. M. Hill, D. L. Heustis and D. C. Lorents</i>	767
XeF Pumped Laser Operation Of Tm ³⁺ :YLF At 453 nm <i>J. W. Baer, M. G. Knights, E. P. Chicklis, H. P. Jenssen</i>	770
Tunable X-Ray Laser <i>L. D. Miller</i>	772
Optimization Of Transition Radiation From Striated Media <i>A. N. Chu, M. A. Piestrup, T. W. Barbee, Jr., and R. H. Pantell</i>	774

A Review Of Recent Proposals For A New Type Of Free Electron Laser Amplifier Based On Low Threshold Radiation Pressure Effects <i>J. L. Hughes</i>	780
New Mechanisms Of Stimulated Radiation By Charged Particles <i>W. W. Zachary</i>	793
Direct Frequency Measurement Of The 260 THz (1.15 μ m) HeNe Laser <i>F. R. Peterson, D. A. Jennings, and K. M. Evenson</i>	798
PANEL DISCUSSIONS	
Can We Build An X-Ray Laser? <i>P. L. Kelley, Chairman</i> <i>R. C. Elton, P. Hagelstein, C. L. Tang, J. F. Young</i>	799
Will Solid State Lasers Be Replaced By Gas Lasers In Future Applications? <i>R. W. F. Gross, Chairman</i> <i>J. F. Daugherty, A. Grziuk, J. Y. Guyot, W. C. Schwartz</i>	809
Can Laser Spectroscopy Ever Come Out Of The Laboratory? <i>M. Birnbaum, Chairman</i> <i>K. M. Evenson, P. L. Kelley, R. M. Measures, H. W. Schlossberg, C. E. Webb</i>	815
Are There Applications Where Integrated Optics Can Compete With Integrated Electronics? <i>E. Garmire, Chairwoman</i> <i>B. Chen, R. R. Rice, C. M. Verber</i>	821
Lasers Savety-Bane Or Benefit? <i>J. Long, Chairwoman</i> <i>P. W. Ascher, D. W. Auth, N. U. Helderman, I. Itzkan, A. M. Johnson</i>	826
Is There A Future For Submillimeter Lasers? <i>K. J. Button, Chairman</i> <i>P. D. Coleman, K. M. Evenson, H. Fetterman,</i>	833
SPECIAL USSR SESSION	
High Power Tunable Pulse IR Lasers Using Laser Pumping <i>A. Z. Grasiuk</i>	837
CO ₂ LASER LINE SELECTION USING A DIFFRACTION INTERFEROMETER <i>V. P. Avtonomov, E. T. Antropov, N. N. Sobolev, and Y. V. Troitsky</i>	837
A Technical 5 KW CO ₂ Laser <i>V. M. Andriakhin, G. Abelsitov, F. K. Koserev, N. P. Kosereva, and A. P. Leonov</i>	837
Materials Treatment (Welding, Hardening) With A CO ₂ Laser <i>V. M. Andriakhin, A. G. Grigoryants, F. K. Koservov, S. M. Stepashin,</i> <i>N. M. Fiskhits, and N. T. Chekanova</i>	837
AUTHOR INDEX	838