

Contents

Part I **Introductory Lectures**

Short Wavelength Lasers for Energy Research By C. Yamanaka (With 19 Figures)	2
Dual-Media Nuclear-Pumped Lasers By G. H. Miley (With 12 Figures)	14

Part II **X-Ray Lasers**

Lawrence Livermore National Laboratory Soft X-Ray Laser Program By J. Trebes, S. Brown, E.M. Campbell, N. Ceglio, D. Eder, D. Gaines, A. Hawryluk, C. Keane, R. London, B. MacGowan, D. Matthews, S. Maxon, D. Nilson, M. Rosen, D. Stearns, G. Stone, and D. Whelan (With 4 Figures)	28
Soft X-Ray Laser Research in the U.K. By S.A. Ramsden, R. Corbett, D. O'Neill, C.S. Lewis, C. Regan, S. Saadat, J. Edwards, G.P. Kiehn, R. Smith, O. Willi, C. Chenais- Popovics, M. Grande, M.H. Key, S.J. Rose, I.N. Ross, T. Tomie, M.J. Henshaw, G.J. Pert, A. Carillon, P. Jaegl�, G. Jamelot, and A. Klisnick (With 7 Figures)	34
Gas-Contact Cooling for Quasi-Stationary Oscillation of the XUV Laser in Recombining Plasmas By T. Oda, K. Takiyama, Y. Kamiura, T. Fujita, K. Sato, K. Ishii, R. Akiyama, M. Otsuka, U. Furukane, H. Sakai, K. Ono, and T. Oomori (With 11 Figures)	42
Laser-Driven Soft X-Ray Laser Experiments at the U.S. Naval Research Laboratory By T.N. Lee, E.A. McLean, and R.C. Elton (With 4 Figures)	50
Amplification of Extreme-Ultraviolet Radiation in Recombining Plasmas with Thin Foil Targets By Y. Kato, P.R. Herman, T. Tachi, K. Shihoyama, K. Kamei, and H. Shiraga (With 6 Figures)	57

Study of Recombination Lasing of C^{3+} By T. Hara, K. Ando, H. Yashiro, M. Hamagaki, T. Fusayama, Y. Segawa, Y. Aoyagi, and S. Namba (With 5 Figures)	66
New Features of the Excitation Mechanism of Ions in Dense Plasmas By T. Fujimoto (With 5 Figures)	70
Review of X-Ray Laser Studies at the GRECO "Interaction Laser- Matière" (Palaiseau) By G. Jamelot, P. Jaeglé, A. Carillon, F. Gadi, B. Gauthé, H. Guennou, A. Klisnick, C. Möller, and A. Sureau (With 10 Figures)	75
Estimations for Optical or MeV Ion Impact <i>K</i> -Shell Ionization X-Ray Laser Schemes By H. Hora (With 3 Figures)	87
Soft X-Ray Spectroscopy and Population Inversion in Laser-Produced Plasmas By Xu Zhi-Zhan and Zhang Zheng-Quan (With 10 Figures)	96
Study on XUV Lasers Produced by a CO_2 Laser By H. Daido, E. Miura, Y. Kitagawa, Y. Kato, K. Nishihara, S. Nakai, and C. Yamanaka (With 9 Figures)	105
Spectroscopic Techniques for X-Ray Laser Research at the Institute of Laser Engineering By P.R. Herman, T. Tachi, K. Shihoyama, K. Kamei, H. Shiraga, and Y. Kato (With 8 Figures)	113

Part III	FEL and Synchrotron Radiation
-----------------	--------------------------------------

Development of Short Wavelength Storage Ring Free Electron Laser Sources By D.A.G. Deacon and J.M.J. Madey	122
Experiment and Theory of an Electromagnetic Wiggler and Induction Linac FEL By K. Mima, Y. Kitagawa, S. Kuruma, T. Akiba, K. Imasaki, N. Ohigashi, Y. Tsunawaki, T. Taguchi, S. Nakai, and C. Yamanaka (With 5 Figures) .	128
Current Status of UVSOR – Ultraviolet Synchrotron Radiation Facility at IMS By H. Yonehara, T. Kasuga, and M. Watanabe (With 5 Figures)	135
Theory of FEL Pulse Propagation: The Small Signal Low Gain Long E- Bunch Regime By G. Dattoli, H. Fang, T. Hermesen, and A. Torre (With 5 Figures)	141
Two-Stage, Short Wavelength Free-Electron Lasers By L.R. Elias, I. Kimel, and Ch. Brau (With 5 Figures)	151

Shortest Wavelength Emission of a Free Electron Laser with Storage Ring ACO at Orsay By M.F. Velghe, C. Bazin, M. Billardon, M. Bergher, M.E. Couprie, J.M. Ortega, R. Prazeres, and Y. Petroff (With 1 Figure)	158
--	-----

Induction Linac Projects at ILE By T. Akiba, K. Imasaki, M. Fukuda, K. Tanaka, S. Miyamoto, K. Mima, S. Kuruma, Y. Kitagawa, N. Ohigashi, Y. Tsunawaki, S. Nakai, and C. Yamanaka (With 12 Figures)	165
--	-----

Two-Stage Free Electron Laser Driven by an Induction Linac By S. Kuruma, K. Mima, Y. Tsunawaki, N. Ohigashi, T. Akiba, S. Miyamoto, K. Imasaki, S. Nakai, and C. Yamanaka (With 4 Figures) .	171
--	-----

Part IV	Excimer Lasers
----------------	-----------------------

Scalability of High Power KrF Lasers for ICF Driver By K. Ueda and H. Takuma (With 11 Figures)	178
---	-----

A High-Power KrF Laser System: ASHURA By Y. Owadano, I. Okuda, Y. Matsumoto, M. Tanimoto, K. Koyama, and M. Yano (With 7 Figures)	188
---	-----

Picosecond Terawatt Excimer Laser System By S. Watanabe, A. Endoh, M. Watanabe, and N. Sarukura (With 8 Figures)	194
--	-----

3-D ASE Calculation for High Output KrF Lasers By A. Sasaki, K. Kasuya, K. Ueda, and H. Takuma (With 7 Figures) . . .	200
--	-----

Strongly Saturated Gain Measurements and Kinetics Study of KrF Lasers By H. Nishioka, T. Kurashima, K. Ueda, and H. Takuma (With 10 Figures)	208
--	-----

Part V	Short-Wavelength Radiation in Laser Fusion
---------------	---

High Power KrF Laser System Employing SBS Pulse Compression By A.A. Offenberger, R. Fedosejevs, J. Santiago, and D. Thompson (With 9 Figures)	216
---	-----

Pellet Implosion by Laser-Produced Short-Wavelength Radiation By S. Nakai (With 13 Figures)	225
--	-----

Experimental Study on Nonuniformity Smoothing in UV Laser-Produced Plasma By K. Koyama, I. Matsushima, M. Tanimoto, Y. Owadano, A. Yaoita, and M. Yano (With 5 Figures)	235
--	-----

Frequency Tripling of the "Gekko XII" Glass Laser System By T. Yamanaka, T. Jitsuno, Y. Izawa, T. Sasaki, K. Yoshida, Y. Kato, S. Nakai, and C. Yamanaka (With 6 Figures)	240
---	-----

Experimental Study and Application of Laser-Produced Plasmas in Two-Plate Targets By R. Kodama, K.A. Tanaka, A. Yamauchi, M. Kado, T. Mochizuki, K. Nishihara, T. Yamanaka, S. Nakai, and C. Yamanaka (With 10 Figures)	246
Soft X-Ray Radiation Transport by Ionization Burnthrough in Hot Dense Plasmas By H. Shiraga, T. Endo, Y. Kato, and C. Yamanaka (With 6 Figures)	254
X-Ray Emission from the Front and Rear Sides of a Gold Foil Irradiated with a Laser By H. Nishimura, T. Yabe, T. Endo, K. Kondo, H. Shiraga, Y. Kato, and S. Nakai (With 2 Figures)	261
Experimental Studies of X-Ray Generation and Its Characteristics in Laser-Produced Plasmas By K.A. Tanaka, R. Kodama, A. Yamauchi, M. Kado, T. Mochizuki, T. Yamanaka, S. Nakai, and C. Yamanaka (With 9 Figures)	265
Interaction of Bound and Free Electrons Both in the Nonequilibrium State By T. Yabe, Y. Murakami, A. Nishiguchi, and M.N. Makar (With 3 Figures)	274
Improvement of the Average Ion Model By S. Kiyokawa and T. Kagawa (With 1 Figure)	278
Computer Simulation of Population Inversion and the X-Ray Lasing of H-like Aluminium by Electron Heat Conduction Cooling in Stagnated Plasmas By K. Nishihara, M. Kuboyama, R. Kodama, and T. Mochizuki (With 10 Figures)	284
Behavior of Soft X-Ray Emitting Plasmas in Cannonball Targets and Their Emission Properties By K. Kondo, H. Nishimura, T. Endo, H. Shiraga, T. Yabe, Y. Kato, and S. Nakai (With 3 Figures)	291
Fast Neutron Detectors for Thermonuclear Burn Time and Duration Measurements in Inertial Confinement Fusion Targets By H. Azechi, N. Miyanaga, R.O. Stapf, M. Yamanaka, C. Yamanaka, and T. Iguchi (With 1 Figure)	296
Radiation-Induced Absorption in Optics for ICF Experiments By G.H. Miley, R. Chapman, J. Nadler, and W. Williams (With 12 Figures)	299
Two-Dimensional Fluid Simulation for Implosion Experiments with the GEKKO XII Green Laser System By H. Takabe (With 5 Figures)	307

Part VI Novel Laser Applications

Generation of Intense, Coherent, VUV and XUV Radiation Using Rare Gas Excimer Lasers By W. Sasaki, K. Kurosawa, P.R. Herman, E. Fujiwara, and Y. Kato (With 8 Figures)	316
The Sr^+ Recombination Laser: A Potential High-Power Blue-Violet Laser By K. Fujii, Ch. E. Little, and J. A. Piper (With 8 Figures)	324
Amplifier Characteristics of an Electron-Beam Excited Atmospheric-Pressure ArF Laser in the Strongly Saturated Region By H. Kumagai, Young-Woo Lee, S. Ashidate, and M. Obara (With 5 Figures)	335
A High Power, Efficient X-Ray Preionization XeCl Laser By T. Hasama, K. Miyazaki, K. Yamada, and T. Sato (With 6 Figures)	340
VUV Generation by Nonlinear Frequency Up-Conversion for Laser Spectroscopy By M. Maeda, T. Okada, and A. Takahashi (With 6 Figures)	345
High Power and High Energy Glass Laser HIREXS By T. Kanabe, E. Tanaka, T. Jitsuno, M. Nakatsuka, S. Nakai, and C. Yamanaka (With 5 Figures)	349
Improvement of the Bulk Laser Damage Threshold of Potassium Dihydrogen Phosphate Crystals for Generation of Higher Harmonics by a High Power Laser By A. Yokotani, Y. Nishida, T. Sasaki, K. Yoshida, T. Yamanaka, S. Nakai, and C. Yamanaka (With 7 Figures)	355
Development of a High Reflectance Coating at 266nm By K. Yoshida, H. Yoshida, M. Ohtani, S. Nakai, and C. Yamanaka (With 4 Figures)	361
Laser Pulse Reshaping in Near-Resonant Sodium Vapor By H. Niki, S. Adachi, Y. Izawa, S. Nakai, and C. Yamanaka (With 5 Figures)	365
Research on Atomic Collisional Processes in Laser Isotope Separation By S. Sakabe, Y. Izawa, T. Yamanaka, K. Nishihara, Y. Mochizuki, H. Naka, A. Tada, M. Kosaka, M. Hashida, S. Nakai, and C. Yamanaka (With 2 Figures)	371

Part VII Applications of Short-Wavelength Radiation

X-Ray Holography: Coherent or Incoherent? By K.A. Nugent (With 4 Figures)	376
--	-----

X-Ray Characteristics of Multilayer Reflectors	
By K. Yamashita, H. Tsunemi, S. Kitamoto, I. Hatsukade, A. Miyake, and Y. Ueno (With 8 Figures)	384
Characteristics of an Optical CCD as an X-Ray Image Sensor	
By H. Tsunemi, K. Mizukata, and M. Hiramatsu (With 5 Figures)	390
Synchrotron Radiation from HiSOR	
By I. Endo (With 5 Figures)	398
X-Ray Lithography Using a KrF Laser-Produced Plasma	
By K. Koyama, T. Tomie, N. Atoda, S. Komeiji, Y. Matsumoto, A. Yaoita, I. Matsushima, and M. Yano (With 8 Figures)	404
Index of Contributors	409