

# Contents

<b>1</b>	<b>Strong-Field S-Matrix Series with Coulomb Wave Final State . . . .</b>	<b>1</b>
	F.H.M. Faisal	
1.1	Introduction . . . . .	1
1.2	Three-Interaction Formalism . . . . .	2
1.3	Coulomb–Volkov Hamiltonian and Propagator . . . . .	6
1.4	Coulomb-Volkov S-Matrix Series . . . . .	9
1.5	Strong-Field S-Matrix for Short-Range Potentials . . . . .	11
1.6	Concluding Remarks . . . . .	11
	References . . . . .	13
<b>2</b>	<b>Multiconfiguration Methods for Time-Dependent Many-Electron Dynamics . . . . .</b>	<b>15</b>
	Erik Lötstedt, Tsuyoshi Kato and Kaoru Yamanouchi	
2.1	Introduction . . . . .	15
2.2	Basics of Time-Dependent Multiconfiguration Methods . . . . .	17
2.3	Time-Dependent Multiconfiguration Methods with Time-Independent Orbitals . . . . .	21
2.3.1	Time-Dependent Configuration Interaction with Single Excitations . . . . .	22
2.3.2	Time-Dependent Restricted-Active-Space Configuration-Interaction . . . . .	23
2.3.3	Time-Dependent <i>R</i> -Matrix Theory . . . . .	25
2.4	Time-Dependent Multiconfiguration Methods with Time-Dependent Orbitals . . . . .	26
2.4.1	Multiconfiguration Time-Dependent Hartree-Fock . . . . .	28
2.4.2	Time-Dependent Complete Active-Space Self-Consistent Field . . . . .	31
2.5	Factorized CI . . . . .	32
2.6	Summary . . . . .	35
	References . . . . .	37

<b>3</b>	<b>Controlling Coherent Quantum Nuclear Dynamics in LiH by Ultra Short IR Atto Pulses</b>	<b>41</b>
	Astrid Nikodem, R.D. Levine and F. Remacle	
3.1	Introduction	42
3.2	Electronic Structure of LiH and Quantum Dynamics	43
3.3	Control of the Fragmentation Yields in the $\Sigma$ Manifold by the CEP of Pulse	49
3.4	Effect of the Non Adiabatic Coupling in the $\Sigma$ Manifold	51
3.5	Probing the Dynamics for a Superposition of $\Sigma$ and $\Pi$ States by Transient Absorption	54
3.6	Conclusions	61
	References	61
<b>4</b>	<b>Probing Multiple Molecular Orbitals in an Orthogonally Polarized Two-Color Laser Field</b>	<b>67</b>
	Hyeok Yun, Hyung Taek Kim, Kyung Taec Kim and Chang Hee Nam	
4.1	Introduction	68
4.2	Two-Dimensional High-Harmonic Spectroscopy of Molecules	69
4.2.1	HHG in an Orthogonally Polarized Two-Color Field	69
4.2.2	HHG from Linear Molecules	72
4.3	Resolving High-Harmonics from Multiple Orbitals	74
4.3.1	Qualitative Approach	74
4.3.2	Theoretical Calculation	76
4.3.3	Experimental Demonstration	79
4.4	Conclusion	82
	References	83
<b>5</b>	<b>Tracing Nonlinear Cluster Dynamics Induced by Intense XUV, NIR and MIR Laser Pulses</b>	<b>85</b>
	Bernd Schütte	
5.1	Introduction	85
5.2	Ionization Dynamics of Clusters	87
5.2.1	XUV Multistep Ionization of Clusters	87
5.2.2	Controlled Ignition of NIR Avalanching in Clusters	89
5.2.3	MIR Strong-Field Ionization of Clusters Using Two-Cycle Pulses	92
5.3	Expansion and Recombination Dynamics of Clusters	94
5.3.1	Cluster Fragmentation	94
5.3.2	Frustrated Recombination	96
5.3.3	Reionization of Excited Atoms from Recombination	97
5.4	Autoionization and Correlated Electronic Decay	101
5.4.1	Autoionization in Expanding Clusters	102
5.4.2	Correlated Electronic Decay	104

5.5	Summary	107
	References	108
<b>6</b>	<b>Molecules in Bichromatic Circularly Polarized Laser Pulses: Electron Recollision and Harmonic Generation</b>	<b>111</b>
	André D. Bandrauk, François Mauger and Kai-Jun Yuan	
6.1	Introduction	112
6.2	Bicircular Recollision Dynamics	114
6.3	Polarization of Molecular HHG	122
6.4	Conclusion	125
	References	127
<b>7</b>	<b>High Harmonic Phase Spectroscopy Using Long Wavelengths</b>	<b>129</b>
	Antoine Camper, Stephen B. Schoun, Pierre Agostini and Louis F. DiMauro	
7.1	Introduction	129
7.2	Reconstruction of the Attosecond Beating by Interference of Two-Photon Transitions	130
7.3	High Harmonic Spectroscopy of Argon Cooper Minimum	133
7.4	High Harmonic Spectroscopy of Aligned Nitrogen	137
7.5	Conclusion	141
	References	142
<b>8</b>	<b>Strong-Field-Assisted Measurement of Near-Fields and Coherent Control of Photoemission at Nanometric Metal Tips</b>	<b>143</b>
	M. Förster, T. Paschen, S. Thomas, M. Krüger and P. Hommelhoff	
8.1	Introduction	143
8.2	Experimental Setup	145
8.3	Measurement of the Field Enhancement Factor at the Tip Apex by Rescattering Electrons	146
8.4	Coherent Control of Photoemission	149
8.5	Summary and Outlook	153
	References	154
<b>9</b>	<b>Advanced Laser Facilities and Scientific Applications</b>	<b>157</b>
	Luis Roso	
9.1	Introduction	157
9.2	Different Approaches for a PW	160
9.3	Bottlenecks	163
9.4	Applications of PW Lasers	168
9.5	Hard Laser Light	172
9.6	Conclusions	176
9.7	Appendix: The VEGA Laser	177
	References	178

<b>10 The Extreme Light Infrastructure—Attosecond Light Pulse Source (ELI-ALPS) Project</b> . . . . .	181
Dimitris Charalambidis, Viktor Chikán, Eric Cormier, Péter Dombi, József András Fülöp, Csaba Janáky, Subhendu Kahaly, Mikhail Kalashnikov, Christos Kamperidis, Sergei Kühn, Franck Lepine, Anne L’Huillier, Rodrigo Lopez-Martens, Sudipta Mondal, Károly Osvay, László Óvári, Piotr Rudawski, Giuseppe Sansone, Paris Tzallas, Zoltán Várallyay and Katalin Varjú	
10.1 Introduction . . . . .	183
10.2 The Mission and Structure of ELI-ALPS . . . . .	184
10.3 Lasers . . . . .	185
10.3.1 The High Repetition Rate (HR) Laser System . . . . .	186
10.3.2 The Single-Cycle Laser System (SYLOS) . . . . .	187
10.3.3 The High-Field (HF) Laser System . . . . .	189
10.3.4 The MIR System . . . . .	191
10.4 Secondary Sources . . . . .	192
10.4.1 The GHHG Beamlines . . . . .	193
10.4.2 The Surface High Harmonic Generation (SHHG) Development Beamlines . . . . .	202
10.4.3 The THz Beamlines . . . . .	207
10.4.4 The Electron Acceleration Beamlines . . . . .	209
10.5 Research Perspectives . . . . .	211
10.6 Outlook . . . . .	214
References . . . . .	215
<b>Index</b> . . . . .	219

Progress in Ultrafast Intense Laser Science XIII

Yamanouchi, K.; Hill III, W.T.; Paulus, G.G. (Eds.)

2017, XIII, 223 p. 99 illus., 83 illus. in color., Hardcover

ISBN: 978-3-319-64839-2