

Contents

CONTRIBUTORS	vii
Comparing the Antiproton and Proton, and Opening the Way to Cold Antihydrogen	
<i>G. Gabrielse</i>	
I. World's Lowest Energy Antiprotons by a Factor of 10^{10}	2
II. Million-Fold Improved Comparison of Antiproton and Proton	19
III. Opening the Way to Cold Antihydrogen	28
IV. Technological Spinoffs	37
V. Acknowledgments	37
VI. References	38
 Medical Imaging with Laser-Polarized Noble Gases	
<i>Timothy Chupp and Scott Swanson</i>	
I. Introduction	42
II. Nuclear Polarization Techniques	49
III. Basics of Magnetic Resonance Imaging (MRI)	63
IV. Imaging Polarized ^{129}Xe and ^3He Gas	74
V. NMR and MRI of Dissolved ^{129}Xe	80
VI. Conclusions—Future Possibilities	87
VII. Acknowledgments	89
VIII. References	89
 Polarization and Coherence Analysis of the Optical Two-Photon Radiation from the Metastable $2^2\text{S}_{1/2}$ State of Atomic Hydrogen	
<i>Alan J. Duncan, Hans Kleinpoppen, and Marlan O. Scully</i>	
I. Introduction	100
II. On the Theory of the Two-Photon Decay of the Metastable State of Atomic Hydrogen	101
III. The Stirling Two-Photon Apparatus	108
IV. Angular and Polarization Correlation Experiments	111
V. Coherence and Fourier Spectral Analysis—Experiment and Theory	127
VI. Time Correlation	133
VII. Correlation Emission Spectroscopy of Metastable Hydrogen: How Real are Virtual States?	133
VIII. Conclusions	144

IX. Acknowledgments	145
X. References	145

Laser Spectroscopy of Small Molecules*W. Demtröder, M. Keil, and H. Wenz*

I. Introduction	149
II. High Vibrational Levels in Electronic Ground States	152
III. Laser Spectroscopy of Electronically Excited Molecular States	171
IV. Sub-Doppler Spectroscopy of Small Alkali Clusters	180
V. Time-Resolved Laser Spectroscopy	187
VI. Conclusions	196
VII. References	196

Coulomb Explosion Imaging of Molecules*Z. Vager*

I. The Principle of Coulomb Explosion Imaging	204
II. Scientific Considerations	205
III. Experimental Details	206
IV. Example of Recent Coulomb Explosion Imaging Studies and Consequences	212
V. Conclusions	237
VI. References	238

SUBJECT INDEX

241

CONTENTS OF VOLUMES IN THIS SERIES

247