Orthogonal Polarization in Lasers. Physical Phenomena and Engineering Applications

Description: This practical book summarizes the latest research results of orthogonally polarized lasers, birefringence laser cavities, and their applications. Coverage ranges from basic principles and technologies to the characteristics of different cavities and lasers to various measurement techniques. A number of figures, experimental designs, and measurement curves are included, helping readers gain a thorough understanding of the many applications in modern engineering and start their own projects. Many types of relevant lasers (Helium/Neon lasers, Nd:YAG lasers, laser diodes, etc.) are also discussed.

Contents:

Foreword xvii
by Zhou Bingkun

Foreword xix
by Konrad Herrmann

Preface xxi

Introduction xxv

Part One FUNDAMENTALS OF LASERS AND BEAM POLARIZATIONS

1 Rigorous Introduction to Lasers and Beam Polarizations 3

1.1 The Basic Amplifier/Cavity Configuration 3

1.2 Optical Waves of a Laser 4

1.3 Cavity Closed-Loop and Laser Threshold 8

1.4 Survey of Techniques for Generating and Converting Laser Polarization States 16

References 24

2 Basic Physical Effects Inside Lasers 25

2.1 Interaction between Light and Particles 25

2.2 Line Shape Function and the Line Broadening Mechanism 30

2.3 Gain Coefficient of Light in an Active Medium 38

2.4 Saturation of Gain in the Laser Active Medium 40

2.5 Threshold Condition, Gain for Stationary Operation, and Lasing Bandwidth 44

2.6 Optical Cavities and Laser Modes 46

2.7 Laser Mode Competition 50

2.8 Mode Push/Pull and Locking Effects 54

2.9 Power Tuning Properties of Lasers 55

References 59
6.5 Frequency Splitting in Semiconductor Lasers 133
6.6 Frequency Splitting in Fiber Lasers 136
6.7 Observation and Readout of Frequency Splitting 137
6.8 Final Remark on Methods Used to Obtain Small and Also Larger Frequency Differences 143
References 143

7 Design of Orthogonally Polarized Lasers 145
7.1 Background 145
7.2 Quartz Birefringence He–Ne Laser 147
7.3 Stress-Induced Birefringence He–Ne Laser 150
7.4 Equidistant Frequency Split Ultrashort He–Ne Laser 153
7.5 Zeeman Birefringence Dual-Frequency He–Ne Laser 154
7.6 He–Ne Laser with Two Intracavity Birefringence Elements 158
7.7 Orthogonally Polarized Lasers with a Superposition Layer Birefringence Film 161
7.8 Laser Diode Pumped Birefringent Nd:YAG Laser with Tunable Frequency Difference 163
7.9 Orthogonally Polarized Lasers with Electrically Controllable Frequency Differences 169
References 170

Part Three NONLINEAR BEHAVIOR OF ORTHOGONALLY POLARIZED LASERS

8 Competition and Flipping Phenomena in Orthogonally Polarized Lasers 175
8.1 Intensity Tuning, Mode Competition, and Frequency Difference Tuning in Dual-Frequency Lasers 176
8.2 Properties of Intensity Tuning and Frequency Difference Tuning in Birefringent Zeeman Lasers 184
8.3 Polarization Properties Caused by Optical Activity of an Intracavity Quartz Crystal 191
8.4 Effect of Optical Activity in the Frequency Difference 198
8.5 Polarization Flipping and Optical Hysteresis in Birefringent Lasers 201
References 209

9 Optical Feedback Effects in Orthogonally Polarized Lasers 211
9.1 General Concept of Laser Feedback 212
9.2 Optical Feedback for Birefringent He–Ne Lasers 216
9.3 Optical Feedback of Birefringence Zeeman Lasers 235
9.4 Optical Feedback with an Orthogonally Polarized External Cavity 241
9.5 Narrow Feedback Fringes of Birefringent Dual-Frequency Lasers 248
9.6 Optical Feedback of a Microchip Nd:YAG Laser with Birefringence 256
14.5 Prospects of Laser-Based Force Measurements 403

References 404

15 Measurements via Translation/Rotation of Intracavity Quartz Crystals 407
15.1 Displacement Measurement by Means of an Intracavity Quartz Crystal Wedge 407
15.2 Measurement of Earth’s Gravity by Means of an Intracavity Quartz Crystal Wedge 409
15.3 Vibration Measurement by Means of an Intracavity Quartz Crystal Wedge 410
15.4 Measuring Rotation Angles by Means of an Intracavity Quartz Crystal Plate 412

References 414

16 Combined Magnetometer/Rate Gyro Transducers by Four-Frequency Ring Lasers 415
16.1 Principle of the Frequency Splitting Ring Laser Weak Magnetic Field Transducer 415
16.2 Experimental Arrangement 418
16.3 Experimental Results and Discussions 419
16.4 Conclusions 420

References 420

17 Further Applications of Orthogonally Polarized Lasers 421
17.1 Tunable Signal Generation 421
17.2 Polarized Lasers in Material Processing 422

References 423

18 Conclusions of Part Four 425
18.1 Phase Retardation Measurement Applications 425
18.2 Displacement Sensing Applications 426
18.3 Force, Pressure, and Acceleration Measurement Applications 426

Index 429


Order by Fax - using the form below

Order by Post - print the order form below and send to

Research and Markets,
Guinness Centre,
Taylors Lane,
Dublin 8,
Ireland.
Fax Order Form
To place an order via fax simply print this form, fill in the information below and fax the completed form to 646-607-1907 (from USA) or +353-1-481-1716 (from Rest of World). If you have any questions please visit
http://www.researchandmarkets.com/contact/

Order Information
Please verify that the product information is correct.

<table>
<thead>
<tr>
<th>Product Name:</th>
<th>Orthogonal Polarization in Lasers. Physical Phenomena and Engineering Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Address:</td>
<td><a href="http://www.researchandmarkets.com/reports/2561418/">http://www.researchandmarkets.com/reports/2561418/</a></td>
</tr>
<tr>
<td>Office Code:</td>
<td>SCDKVEI3</td>
</tr>
</tbody>
</table>

Product Format
Please select the product format and quantity you require:

- Hard Copy (Hard Back): USD 162 + USD 29 Shipping/Handling

* Shipping/Handling is only charged once per order.

Contact Information
Please enter all the information below in BLOCK CAPITALS

<table>
<thead>
<tr>
<th>Title:</th>
<th>Mr ☐ Mrs ☐ Dr ☐ Miss ☐ Ms ☐ Prof ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name:</td>
<td></td>
</tr>
<tr>
<td>Last Name:</td>
<td></td>
</tr>
<tr>
<td>Email Address: *</td>
<td></td>
</tr>
<tr>
<td>Job Title:</td>
<td></td>
</tr>
<tr>
<td>Organisation:</td>
<td></td>
</tr>
<tr>
<td>Address:</td>
<td></td>
</tr>
<tr>
<td>City:</td>
<td></td>
</tr>
<tr>
<td>Postal / Zip Code:</td>
<td></td>
</tr>
<tr>
<td>Country:</td>
<td></td>
</tr>
<tr>
<td>Phone Number:</td>
<td></td>
</tr>
<tr>
<td>Fax Number:</td>
<td></td>
</tr>
</tbody>
</table>

* Please refrain from using free email accounts when ordering (e.g. Yahoo, Hotmail, AOL)
Payment Information

Please indicate the payment method you would like to use by selecting the appropriate box.

☐ Pay by credit card: You will receive an email with a link to a secure webpage to enter your credit card details.

☐ Pay by check: Please post the check, accompanied by this form, to:

Research and Markets,
Guinness Center,
Taylors Lane,
Dublin 8,
Ireland.

☐ Pay by wire transfer: Please transfer funds to:

Account number 833 130 83
Sort code 98-53-30
Swift code ULSBIE2D
IBAN number IE78ULSB98533083313083
Bank Address Ulster Bank,
27-35 Main Street,
Blackrock,
Co. Dublin,
Ireland.

If you have a Marketing Code please enter it below:

Marketing Code: 

Please note that by ordering from Research and Markets you are agreeing to our Terms and Conditions at http://www.researchandmarkets.com/info/terms.asp