

INDEX

- Absorption, 127
Add/drop multiplexer, 174
Amplified spontaneous emission, 136
Amplitude modulation, 18
Analog modulation, 17
Anomalous group velocity dispersion, 79
Anti reflection coatings, 170
Anti-Stokes lines, 152
APD, 114
Arrayed waveguide gratings, 196
ASE, 136
Attenuation in optical fibers, 55
Attenuation limited distance, 121
AWG, 196
- Bandwidth requirement, 24
Beam splitter, 187
Beam waveguide, 31
Beat noise, 139
Bell's experiment, 28
Bent fiber, 63
BER, 117
Bit error rate, 117
Bit rate requirement, 26
Bragg wavelength, 170
Breakout cable, 54
Brillouin scattering, 152
Buried heterostructure laser, 104
- Cables, 53
Carrier wave communication, 17
Cascaded Raman laser, 166
C-band, 62
Chirped dispersion compensating grating, 177
Chirped fiber Bragg grating, 176
Chirped pulse, 210
Circulator, 195
Cold light source, 35
Communication, 17
- Cones, 37
Connectors, 188
Conventional band, 62
Coupler fabrication, 193
Couplers, 189
Coupling ratio, 191
Critical angle, 12
Cross phase modulation, 215
Current sensor, 228
- DBR, 108
DCF, 92
Decibel, 55
Dichroic splitter, 187
Differential mode delay, 82
Digital modulation, 21
Diode laser, 102
Directional couplers, 189
Directivity of a coupler, 192
Dispersion, 15
Dispersion compensating fibers, 92
Dispersion compensation, 92, 175
Dispersion limited distance, 122
Dispersion management, 94, 218
Dispersion shifted fiber, 89
Dispersion slope, 90
Dispersion slope compensating fibers, 95
Distributed Bragg reflector laser, 108
Double clad fiber design, 148
Double Rayleigh scattering, 166
- E-band, 62
EDFA, 125
EDFA gain equalizer, 175
EDFA, gain flattening of, 184
Effective index, 41
Electromagnetic spectrum, 8
Electromagnetic waves, 6
Electronic regenerator, 126

240 INDEX

- Electrooptic coefficient, 198
- Electrooptic modulator, 200
- Elliptic core fiber, 98
- Endoscope, 37
- Erbium doped fiber, 130
- Erbium doped fiber amplifier, 125
- Excess loss, 191
- Extended band, 62
- External cavity lasers, 108
- External modulators, 197
- Extrinsic sensors, 222
- Eye diagram, 118, 201
- Eye pattern, 92

- Fabrication of couplers, 193
- Fabrication of optical fibers, 48
- Fabry Perot interferometer, 203
- Fabry Perot laser diodes, 102
- Faraday effect, 194, 228
- FBG, 168
- FBG, applications of, 174
- FBG-based sensors, 178
- FBG, fabrication of, 182
- FBG, strain sensitivity of, 179
- FBG, temperature sensitivity of, 179
- Fiber Bragg grating, *see* FBG
- Fiber endoscope, 37
- Fiber grating-based sensors, 178
- Fiber isolators, 193
- Fiber laser, 125, 145
- Fiber optic bundle, 34
- Fiber optic cables, 53
- Fiber optic communication systems, 100
- Fiber optic components, 186
- Fiber optic connectors, 188
- Fiber optic couplers, 189
- Fiber optic current sensor, 228
- Fiber optic display, 35, 36
- Fiber optic gyroscope, 232
- Fiber optic patch cords, 189
- Fiber optic rotation sensor, 232
- Fiber optic sensors, 221
- Fiber optic traffic sign, 35
- Fiber pulling apparatus, 50
- Fiber to the home, 63
- Fluorescence, 130
- FOG, 232
- Fourier transform pulse, 80
- Four wave mixing, 216
- Free space optics, 52
- Frequency, 3
- Frequency modulation, 20
- FTTH, 63
- Fused fiber coupler, 193
- FWM, 216

- G.652 fiber, 88, 208
- G.653 fiber, 90, 208
- G.655 fiber, 90, 208
- Gain coefficient, 159
- Gain flattening of EDFA, 134
- Gain saturation, 142
- Gain spectrum, EDFA, 131
- Gain transients, 144
- Glass fibers, 34
- Graded index media, 14
- Graded index multimode fibers, 44
- Graded index multimode fibers, ray paths in, 45
- Graham Bell's experiment, 28
- Grating-based sensors, 178
- Group refractive index, 77
- Group velocity, 77
- Gyroscope, 232

- Heterojunction lasers, 103
- High power fiber lasers, 149
- Holey fibers, 211
- Homojunction lasers, 103

- Insertion loss, 191
- Intensity of lightwave, 6
- Intermodal dispersion, 73, 87
- Intramodal dispersion, 87
- Intrinsic sensors, 222
- Iridescent colors, 171
- Isolators, 193
- ITU specifications, 109

- Junction laser, 102

- Laser diodes, 102
- L-band, 62
- LEAF, 90
- LED, 111
- Light emitting diodes, 111
- Lightwaves, 3
- Long band, 62
- Long period gratings, 169. *See also* LPG
- Loss in optical fibers, 55, 58
- Low water content optical fiber, 60
- LPG, 169, 183
- LPG, applications of, 184
- LPG, transmission spectrum of, 183

- Mach Zehnder interferometer, 187
- Mach Zehnder interferometric modulator, 199
- Mach Zehnder interferometric sensor, 229
- Material dispersion, 77
- Maximum bit rate, 84
- MCVD, 48
- Microbend sensors, 225
- Midstage access amplifier, 141
- Mirage, 14
- Multilayer structure, 170
- Multilongitudinal mode laser, 107
- Multimode fiber, 42
- Multimode fiber, pulse dispersion in, 71
- Multimode fibers, laser optimized, 82
- Multiplexer, 174

- Nanofibers, 51
- Negative dispersion, 80
- Noise in EDFA, 136, 140
- Noise in Raman amplifiers, 162
- Nonlinear effects in optical fibers, 205
- Nonlinear fiber optics, 205
- Non-return-to-zero scheme, 23
- Nonzero dispersion-shifted fiber, 90
- NRZ format, 23, 117
- Numerical aperture, 39
- Numerical aperture, measurement of, 39
- NZ-DSF, 90, 217

- O-band, 62
- Old band, 62
- On-off keying, 23
- OOK, 23
- Optical fiber, 28
- Optical fiber sensors, 221
- Optical fibers, fabrication of, 48
- Optical sources, 101
- Optical switches, 202
- Optical time domain reflectometer, 65
- Optimum profile, 72
- OSNR in EDFA, 138
- OTDR, 65

- Parabolic index fibers, 75
- Patch cords, 189
- PCF, 208, 211
- Photodetectors, 112
- Photonic crystal fiber, *see* PCF
- PIN, 114
- Plastic optical fibers, 52
- PMD, 96
- p-n* junction, 102
- Polarization controllers, 187
- Polarization mode dispersion, 97
- Population inversion, 129
- Positive dispersion, 80
- Power dividers, 192
- Preform fabrication, 48
- Prism coupling, 43
- Pulse code modulation, 23
- Pulse dispersion, 70
- Pulse dispersion in single-mode fibers, 86
- Pump laser, 130

- Rainbow, 16
- Raman anti-Stokes lines, 152
- Raman effect, 151
- Raman fiber amplifiers, 151
- Raman fiber amplifiers, applications of, 164
- Raman gain coefficient, 159
- Raman Krishnan effect, 156
- Raman shift, 152
- Raman Stokes lines, 152
- Ray dispersion, 73
- Rayleigh scattering, 33, 59, 153
- Rayleigh scattering, demonstration of, 64
- Ray paths in parabolic index fibers, 76
- Reflection spectrum from FBG, 173
- Refraction, 10
- Refractive index, 9
- Regenerators, 100
- Return to zero, 23
- RFA, 151
- Rods and cones, 37
- Rotation sensors, 232
- RZ scheme, 23, 117

- Sagnac effect, 233
- Sagnac interferometer, 187
- Sampling theorem 21
- S-band, 62
- Scintillating fibers, 36
- Second harmonic generation, 207
- Self-phase modulation, 207
- Semiconductor laser, 102
- Short band, 62
- Shot noise, 114
- Signal-to-noise ratio, 116
- Single-mode fiber, 42
- Single-mode fibers, pulse dispersion in, 86
- Small residual dispersion fiber, 96
- Small signal gain, 133
- Snell's law, 10
- SNR, 116
- Solitons, 212
- Splice loss, 47

242 INDEX

SPM, 207
Spontaneous emission, 127
Spontaneous Raman scattering, 157
Spot size, 46
Standard bit rates, 27
Step index optical fiber, 32
Stimulated absorption, 127, 128
Stimulated emission, 127
Stimulated Raman scattering, 157
Stokes lines, 152
Strain optic effect, 179
Supercontinuum generation, 211, 214, 219

Temperature sensitivity of FBG, 179
TeraLight fiber, 90
Thermal noise, 115
Thermooptic switch, 200
Thin-film devices, 203
Three level system, 130
Tight buffer coated fiber cable, 54
Time-division multiplexing, 26
Total internal reflection, 13

True wave reduced slope fiber, 90
Tunable diode laser, 110

Undersea fiber optic systems, 124

VCSEL, 105
Vertical cavity surface emitting laser, 105
V-number, 42

Waterjet experiment, 13
Waterwaves, 4
Wave breaking, 206
Waveguide dispersion, 86
Waveguide parameter, 42
Wavelength, 3
Wavelength converters, 202
Wavelength division multiplexers, 193
Wavelength selective mirror, 187
Waves, 3
WDM system, 216

XPM, 215
Zero dispersion wavelength, 81, 87