

Index

- ABCD representation of transmission line 107
- active channel waveguide components 166
- acousto-optical deflector 141
- acousto-optical effect 88
- acousto-optical frequency shift 94, 146
- acousto-optical interaction 141–144
- acousto-optical RF spectrum analyzer 145
- acousto-optical scanner 144
- acousto-optical scanner, spectrum analyzer, frequency shifter 141
- adiabatic propagation of super modes 58
- adiabatic transition 58–60
- analog electro-absorption modulation 179
- analog Mach–Zehnder modulation 173–174
- asymmetric planar waveguides 7
- bandwidth of lumped EA modulators 181
- bandwidth of lumped MZ modulators 174
- bandwidth of traveling wave phase modulator 186
- Bragg condition for acousto-optical deflection 93, 142
- Bragg condition for grating reflection 48, 129
- Bragg reflection at higher order 129
- channel waveguides 23
- characteristic impedance of transmission lines 103
- chirp characteristics of MZ modulators 174
- chirp characteristics of EA modulators 181
- co-linear grating filter in planar waveguides 128–129
- co-linear grating mode converter 129–130, 138
- comparison of directional coupler and MZ modulators 183–184
- comparison of electro-optic and electro-absorption modulators 181–182
- comparison of Fabry–Perot and ring resonators 163–164
- comparison of Frantz–Keldysh and QW electro-absorption 86
- comparison of power splitters 153
- contrast ratio 174, 181
- coupled mode analysis 42–43
- coupled mode analysis of grating reflection filter 46
- detection of planar guided waves 125
- diffraction, focusing and collimation of planar guided waves 127
- diffraction by acoustical waves 92
- diffraction of end-excited planar guided waves 119–120
- diffraction of plane waves in waveguide structures 3
- directional coupler 49, 149
- directional coupler, coupled mode analysis 49–52
- directional coupler, super mode analysis 58
- directional coupler modulator and switch 182–183
- directional coupler power divider 149–150
- directional coupler with variable gap 161
- effective index method 23–26
- electric field in transmission lines 112–113
- electrical properties of devices at high frequencies 102
- electrical properties of devices at low frequencies 98
- electrical representation at high frequencies 102–104
- electrical representation at low frequencies 98
- electrical transmission line analysis 107
- electro-absorption effect 78
- electro-absorption modulator 176
- electromagnetic analysis of modes 6
- electro-optic effect in plane waves 72–74
- electro-optic effect in waveguides 74
- electro-optic effects in GaAs and InP waveguides 76–77
- electro-optic effects in LiNbO₃ waveguides 74–76
- electro-optic effects in polymer waveguides 76
- electro-optic phase modulator 168–169
- electro-optic Pockel's effect 70
- electro-refraction effect 87
- end excitation of planar guided waves 117–119
- energy levels in quantum wells 81–82
- example of effective index analysis 26
- example of super mode analysis 54
- excitation and detection of planar guided waves 117
- excitons 79
- excitons in quantum wells 82–83
- fields and capacitance of electrodes 169–170
- finesse, Fabry–Perot resonator 159
- finesse, ring resonator 163
- focusing and collimation of planar guided waves 133–134
- formation of optical waveguides 31

- Frantz–Keldysh effect 79–81
 free spectra range 159, 162
 frequency and time response 97
 frequency response of devices at low frequencies 99–101
- general characteristics of guided waves 5–6
 generalized planar guided waves 20
 Goos–Haenchen shift 123
 grating coupler for planar guided waves 125
 grating coupling to radiation modes 130–131
 grating deflection 131–132, 136–138
 grating description 127–128
 group velocity 112, 191
- Helmholtz equation 21–22
- impedance matching 110
 impedance matrix representation 108
 input impedance 105
 insertion efficiency 172, 183
- Kramers–Kronig relation 87
- lens, Fresnel 134
 lens, geodesic 134
 lens, Luneberg 134
 lens in planar waveguides 23
 linewidth, Fabry–Perot resonator 159, 160
 linewidth, ring resonator 163
 longitudinal fields 40
 lumped element modulators and switches 167
- m*-lines 125
 Mach–Zehnder interferometer 63
 Mach–Zehnder modulator analysis 170–172
 Mach–Zehnder modulator in III–V compound semiconductor 173
 Mach–Zehnder modulator in LiNbO₃ 172–173
 Mach–Zehnder modulator in polymer 173
 Mach–Zehnder modulators 170, 172–173
 Mach–Zehnder switches 175
 mode extinction modulator 176
 multimode interference coupler 64–67
 multimode interference power divider 153
- n_{eff} 9, 25
 n_{eff} measurement 160
 non-linear distortion, electro-absorption modulator 180
 non-linear distortion, Mach–Zehnder modulator 174
- optical delay line 165
 optical waveguides in polymers 35–36
 optical waveguides on GaAs or InP 33–35
 optical waveguides on LiNbO₃ 32–33
 optical waveguides on Si substrates 36–37
 overlap integral 29, 119, 178
- parallel plate electrode approximation 113, 169
 passband of grating filter 49
 passive channel waveguide components 148
 performance of MZ modulators 174
 performance of phase modulators 170
 perturbation analysis 40, 42
 perturbation analysis of two coupled waveguides 45
 perturbation by a nearby dielectric 43
 perturbation by electro-optical effects 90
 perturbation effect 41
 phase matching in grating reflector 47–48
 phase modulator 168
 phase velocity of microwaves 103, 191
 phased array channel waveguide demultiplexer (PHASAR) 154
 planar guided waves from a line source 22
 planar waveguide devices 117
 plane waves in anisotropic medium 71–72
 plane waves in LiNbO₃ 72
 power divider 149
 prism coupler 121–122, 123–124
 prism coupling analysis 122–123
 prism output coupler 125–126
 prisms in planar waveguides 133
 propagation in microwave transmission line 104–105, 185
 propagation loss of optical waveguides 164–165
 properties of channel guided-wave modes 27–28, 40–41
 properties of TE planar guided-wave modes 11–13
 properties of TM planar guided-wave modes 17–19
 pulse and frequency response 111
- Q* factor, Fabry–Perot resonator 159
Q factor, ring resonator 163
 Quantum Confined Stark Effect (QCSE) 84
 quantum well electro-absorption 81
 quantum well material characterization 86
 quantum well saturation 86
- radiation loss of curved waveguides 164
 reflection coefficient in transmission line 105
 reflectors, channel waveguides 157–158
 reflectors, grating 136, 157
 reflectors, Y-branch 157
 refraction in planar waveguides 132–133
 representation and excitation of fields in waveguides 28–30
 resonator optical delay lines 165
 resonators 158
 resonators, Fabry–Perot 158–160
 resonators, ring 160–163
 resonators, time and frequency response 166
- saturation of electro-absorption modulation 180–181
 scalar approximation of waveguide equations 30
 scattering matrix representation 109

- Smith chart 105
- Snell's law of refraction for planar waveguides 120
- spurious free dynamic range 174, 180
- Star coupler 138, 151
- super mode analysis 52
- super modes of coupled dissimilar waveguides 58
- super modes of coupled identical waveguides 52
- super modes of waveguides with variable coupling 57
- super modes viewed from coupled mode analysis 56
- surface acoustic wave generation 89–90
- susceptibility effect in plane wave propagation 69–70
- susceptibility tensor 71
- tapered coupler 125
- Taylor series expansion of $T(V)$ 173, 179
- TE and TM modes in planar waveguides 7
- TE modes in planar waveguide 8
- TE planar air modes 14–15
- TE planar guided-wave modes 8–9
- TE planar guided-wave modes, cut-off 11
- TE planar substrate modes 13–14
- TE symmetric planar guided-wave modes 9–10
- TM modes of planar waveguides 15
- TM planar air modes 19–20
- TM planar guided-wave modes 15–17
- TM planar guided-wave modes, cut-off 17
- TM planar substrate modes 19
- transient characterization of transmission line 111
- transmission and reflection of grating filter 49
- transverse electro-magnetic fields 40
- traveling wave directional coupler modulator analysis 187–188
- traveling wave directional coupler modulator/switch 187
- traveling wave electro-absorption modulators 188–189
- traveling wave electrode design 190
- traveling wave electro-optic modulators 185
- traveling wave interactions 114
- traveling wave Mach–Zehnder modulator/switch 186
- traveling wave modulators and switches 184
- traveling wave phase modulators 185–186
- traveling wave representation of $\Delta\alpha_{\text{RF}}$ 188
- traveling wave representation of Δn_{eff} 185
- V_{π} 172, 183
- $V_{\pi, \text{eq}}$ 180
- waveguide loss measurement 126–127, 160
- wavelength filtering/multiplexing 153
- wavelength filtering, reflection 154
- wavelength filtering, resonance 157
- Y-branch, asymmetric 62
- Y-branch, symmetric 60–62
- Y-branch power distributor 151–153
- Y-branch power splitter 149
- Y-branch reflector 62