

# Index

- (001) 118
- (110) 118
- 2DEG 152
  
- adiabaticity 237
- Aharonov-Bohm phase 269
- AlGaAs/GaAs systems 44
- all-optical NMR 177, 178, 187
- AMR 54
- Andreev tunneling 261
- angular dispersion 197, 198
- anisotropic exchange 245
- Arrott plots 7
  
- ballistic transport 66
- band offset 167
- beam splitter 267
- BEEM 84
- Bell's inequality 301
- BEMM 84
- Berry phase 255
- BIA in quantum wells 118
- biased spin transfer 174
- biexcitons 270
- billiard model 71
- Boltzmann distribution 95
- boundary scattering 76
- Büttiker-Landauer model 66
- bulk elastic scattering 76
- bulk inversion asymmetry (BIA) 115
- bunching 266
  
- carrier-induced ferromagnetism 12
- cavity resonances 289
- CdS<sub>x</sub>Se<sub>1-x</sub> 162
- CdSe 160
- charge packet 134
- CNOT 241
  
- coercive field 187
- coherence 232
- coherence time 225
- coherent control 203
- coherent manipulation 181
- coherent orbital excitation 121
- coherent spin transfer 170, 173
- coherent spin transport 162
- coherent superposition 148
- composite bosons 206
- conduction band 96
- conductivity mismatch 63
- Cooper pairs 261
- cotunneling 268
- cotunneling current 255
- Coulomb blockade 248
- Coulomb interaction 242, 265
- coupled quantum dots 241
  
- D'yakonov and Perel' theory 115
- D'yakonov-Kachorovskii theory 127
- DBR mirror 288
- decoherence 222, 232
- degenerate 96
- dephasing 122, 173
- diffusion 132
- diffusive transport regime 131
- digital (Ga,Mn)As 184
- diluted magnetic semiconductors 94
- dipole coupling 245
- distributed Bragg reflectors 203
- DMS 94
- domain structure 6
- double occupation 237
- double perovskites 105
- double-dots 268, 269
- DP 157
- drift-diffusion equations 132

- Dyakanov-Perel 155  
 dynamic nuclear polarization (DNP)  
     177  
 effect anomalous Hall effect 6  
 effective crystal magnetic field 123  
 Einstein's relation 136  
 electric field 163, 171  
 electric quadrupole 180  
 electrical control 190  
 electrical spin injection 21, 93, 94  
 electroluminescence 97  
 electron spin resonance 233, 251, 256  
 Elliot-Yafet (EY) mechanism 111,  
     155, 157  
 encoding 252  
 energy bottleneck 109  
 entangled electrons 265  
 entangled photon pairs 298  
 entangled photons 270, 301  
 entanglement 231, 261, 272  
 entangler 254, 260, 269  
 EPR pairs 230, 260  
 EPR-type correlation 214  
 exchange coupling 236, 241  
 exchange field 176  
 exchange integral 9  
 exchange interaction 248  
 excitation voltage 103  
 excitons 196, 278  
 extended X-ray absorption fine  
     structure 4  
 Faraday geometry 151  
 Faraday rotation 152  
 Fe/GaAs 188  
 femtosecond goniometer 202  
 Fermi sea 265  
 ferromagnetic dots 252  
 ferromagnetic imprinting of nuclear  
     spins 188  
 ferromagnetic semiconductors 1  
 ferromagnets 183  
 fluctuating field 125  
 fluctuating field reversal 124  
 fourteen-band basis 125  
 GaAs 148, 153  
 (Ga,Mn)As 1  
 GaAs/ZnSe 166  
 gain 207  
 GaN 153, 158  
 gate control 43  
 gate errors 246  
 gate precision 239  
 g-factor 237, 251  
 giant magnetoresistance (GMR) 31  
 giant Zeeman-splitting 95  
 Grover's algorithm 259  
 g-tensor 179  
 Hall effect 6  
 Hanle effect 34  
 harmonic analysis 165  
 Haynes-Shockley experiment 131  
 heavy hole 95  
 Heisenberg spin Hamiltonian 240  
 Heitler-London 242, 270  
 hole injection 100  
 Hund-Mulliken 243  
 hyper-Raman 199  
 hyperfine interaction 177, 184, 187,  
     235  
 II-VI DMS 94  
 impure metal films 39  
 impurity band 98  
 InGaAs system 45  
 inhomogeneous broadening 181  
 inhomogeneous dephasing 155  
 initialization 240  
 interband coherence 195  
 interferometers 212  
 inversion asymmetry 115  
 ion traps 226  
 Josephson junction 270  
 junction scattering 75  
 Kerr rotation 167  
 Kondo effect 248  
 Kondo peaks 249  
 (In,Mn)As 1  
 large-spin systems 259  
 Larmor frequency 72, 152  
 Larmor magnetometry 177, 178  
 Larmor precession 149, 150

- lateral coherence length 200
- leakage 229
- LED 96
- light hole 95
- linear response 103
- liquid-state NMR 226
- local charge imbalance 133
- local charge neutrality 133
- local Hall effect 50
- Luttinger liquid 264
  
- magnetic circular dichroism 99
- magnetic dipole 180
- magnetic hysteresis loop 184
- magnetic ions 175
- magnetic resonance force microscopy 87
- magnetic tunnel junction devices 31
- magneto-electronics 160
- MCD 99
- mean field model of the ferromagnetism 12
- metal-insulator transition 154, 158
- microcavities 286
- microcavity 196, 277
- Mn<sup>2+</sup> 175
- mobility of spin packets 132
- molecular magnets 259
- molecular-beam epitaxy 2
- Monte Carlo 72
- MRFM 87
- multiterminal spin valve structures 59
  
- nanotubes 264
- native interface asymmetry (NIA) 117
- negative magnetoresistance 9
- NiMnSb 105
- no-common-atom system 120
- noise 266
- nonequilibrium spin polarization 86
- nonideality parameter 38
- nonlocal 35, 54
- nuclear polarization 180, 187
- nuclear spin 184, 186, 235, 259
- nuclear-spin qubit 223
  
- optical cavity 279
- optical circular polarization 96
- optical detection 95
  
- optical parametric amplifiers 182
- optical parametric oscillator 208
- optical Stark effect 182
- optimized devices 51
- orbital scattering times 123
- ordinary Hall effect 6
- oscillator strength 271
  
- $\pi$ -pulse 181
- $\pi/2$  pulse 181
- p-n junction 175
- p-n junctions 166
- pair-scattering 205
- parabolically-graded 190
- paramagnetic dot 253
- persistent spin current 174
- phase 195
- phase scattering 209
- phase shift 170
- phonon 234
- photolithography 49
- photoluminescence 100, 150 281
- Poissonian statistics 277
- polariton condensate 208
- polariton traps 198
- polaritons 196
- potentiometric 35
- POV measurements 253
- precessional decoherence 112, 122
- precessional dephasing 111
- Purcell effect 279
- Purcell factors 297
  
- quality factor ( $Q$ ) 157
- quantum communication 231, 260
- quantum computation 147, 160, 182, 221, 230
- quantum cryptography 217, 222, 277
- quantum dots 86, 160, 231, 279
- quantum error correction 238
- quantum gates 222, 240
- quantum point contacts 86
- quantum well 152
- quasiparticle 266
- qubits 222, 230
  
- Rabi oscillations 257
- Rashba effect 119
- Rashba field 43, 73

- Rashba frequency 74
- read-out 253, 258
- recombination process 95
- resonant depolarization 178
- resonant spin amplification 152
- resonant-tunneling diode 19
- RSA 152, 155, 163, 172
  
- scalability 236
- scattering
  - of electrons from ionized impurities (II) 124
  - of electrons from optical phonons (OP) 124
  - of electrons from point-like neutral impurities (NI) 124
- scattering-driven decoherence 111
- Sharvin resistance 70
- Schottky barrier 140
- Schottky contacts 83
- screening in semiconductors 131
- selection rules 99
- self-assembled quantum dots 244
- semiconductor 93
- single photon turnstile 300
- single photons 277, 285
- single-spin decoherence 256
- singlet-triplet crossing 243
- space-charge field 135
- spin accumulation time 168
- spin aligner 97
- spin and charge packets 138
- spin coherence 160
  - time 233
  - times  $T_1$  and  $T_2$  108
- spin condensates 213
- spin Coulomb drag 137
- spin current 172
- spin decoherence times 126
- spin diffusion 163
  - constant 166
  - lengths (downstream) 139
  - lengths (upstream) 139
- spin drift 164, 166
- spin-FET 41
- spin filter 254
- spin flip scattering 75
- spin imprinting 40
- spin injection 93, 141
- spin lifetime 43
- spin memory 258
- spin packets 134, 163
- spin polarized transport 93
- spin pumping 255
- spin relaxation 233
- spin rotations 250
- spin stiffness 137
- spin transfer 40, 168, 169
  - efficiency 48, 168
- spin transistor 40, 77
- spin transport 131, 166
- spin transresistance 73
- spin-dependent scattering 17
- spin-disorder scattering 9
- spin-flip scattering 175
- spin-orbit coupling 158, 234, 245
- spin-polarized semiconductor 138
- spin-singlet 242
- spin-triplet 242
- spintronics 147, 221
- spontaneous electron spin coherence 188
- standard model 56
- stimulated parametric scattering 206
- STM 84
- strong coupling 196
- strong-confinement 160
- structural inversion asymmetry (SIA) 116, 119
- superconductors 261
- superexchange 247
- switching 236
- switching time 237
- symmetry of (001)-grown quantum wells 118
- symmetry of (110)-grown quantum wells 118
  
- $T_2^*$  149
- $T_1$  147
- $T_2$  147, 149
- threading dislocation 158
- THz frequencies 175
- Ti-sapphire laser 150
- time resolved Faraday rotation 151
- time-domain spin-resonance 176
- time-resolved Faraday effect 147
- time-resolved Faraday rotation 160

- time-resolved Kerr rotation 151
- time-reversal (Kramers) symmetry 110
- timeline 224
- transfer mechanisms 173
- transverse spin lifetime 168
- TRFR 151, 153, 163, 178, 184, 189
- TRKR 153, 168
- tunnel magnetoresistance 17
- tunnel-coupling 242
- tunneling 32
- turnstile operation 299
- two dimensional electron gas 152
- two-color pump-probe 167
- ultrafast coherent control 182
- ultrafast switching 205
- uniaxial magnetic anisotropy 189
- Voigt 163
- Voigt geometry 150, 151, 179, 184, 189
- wavefunction annealing 199
- XOR 241
- Zeeman coupling 250
- Zeeman splitting 95
- ZnSe 148, 152, 153
- ZnSe/(Zn,Cd,Mn)Se 175