Index

Activation energies, 50
Adler, R., 220, 223
Agdur, B., 88
Amo, K., 149
Amplification factor, 54
  current, 335
Amplifier, backward-wave 78, 220
  broad-band, 392
  double-stream, 78
  low-noise transistor, 388
  resistive-wall, 78
  rippled-stream, 78
  rippled-wall, 78
  space-charge-wave, 78
Anderson, R. L., 64, 331, 360
Anomalous flicker noise, 45, 67

Backward space harmonics, 278
Backward-wave amplifier, 78, 220
Bakker, C. J., 168, 177, 209
Ballentine, S., 157, 167
Base, 333
  internal, 333
Base-lead resistance, 347
Base resistance, true, 333
Base-width modulation, 335
Beam, W. R., 224, 226, 235, 265, 272, 285, 287, 293, 298
Beam modes, higher-order, 228, 233, 269, 298
Beam transducers, 105
Beam-transmission defects, 222, 224
Beck, A. H. W., 163, 165
Becking, A. G. Th., 330, 342
Bell, R. L., 169, 170, 200, 201
Berktay, H. O., 63
Bernamont, J., 316, 318
Binomial-law distribution, 318
Birdsall, C. K., 78, 222
Bloom, S., 42, 93, 105, 128, 145, 222, 224–227, 229, 235, 236, 240, 243, 298
Buchmiller, L. D., 259
Bulk, 184
Burgess, R. E., 50, 320

Camerini, U., 403
Campbell, N. R., 163
Carrier, majority, density fluctuations of, 317
  minority, density fluctuations of, 318
Carrier diffusion, 325, 342
Carrier drift, 312, 315, 324
Carrier extractions, 333
Carrier injection, 333
Carrier mobility, 314, 318
Cataphoretic coating, 66
Cathaloy, 65
Cathode, 223, 260
  L, 69
  oxide-coated, 63, 67

Cathode, thoriated tungsten, 69
tungsten, 67
Cathode coating, 74
Cathode coating resistance, 183
Cathode poisoning, 67
Champlin, K. S., 331
Characteristic beam impedance, 90, 237, 245
Child, D. C., 2, 3
Chu, L. J., 85, 88
Clark, M. A., 338, 340
Clogston, A. M., 80
Collector, 333
design of, 278
Collector current, 334
saturated, 335
Collisions, long-range, 79
short-range, 79
Compaan, K., 71
Compensating current, 178
Compton, K. T., 2, 8
Concentration fluctuations, 313, 314
Conservation of power, 105
Continuity equation, 82, 83
Coor, T., 403
Correlation, 169, 194, 212
Correlation admittance, 195
Correlation coefficient, 195, 337
Correlation measurement, 212
Cross-power density spectrum, 117
Crystal rectifier, 205
Current generator, 46
Current smoothing factor, 231
Cutler, C. C., 80, 140, 288

Dahlke, W., 190
Danielson, W. E., 145, 224, 225
Davies, J. H., 403
Davydov, B., 316, 317, 318
de Grasse, R. W., 259
Depletion layer, 64, 71
Detector, low-level, 332
Diemer, G., 162
Diffusion coefficient, 325
Diffusion fluctuations, 326
Diode, mixer, 332
parallel-flow, 243
plane-parallel, 2
point-contact, 332
semiconductor, 354, 361, 372, 400
Diode conductance, 32
Distribution function, 4
Dodds, W. J., 298
Donors, ionized, 322
neutral, 322
Double-stream amplifier, 78
Dow, W. G., 160
Drift region, 248
Drift time, 315
Duvall, G. E., 52, 157, 158, 162, 182

Early, J. M., 336, 393
Early effect, 335
Ecker, G., 79
Eichenbaum, A., 248, 263, 270
Einzel lens, 279
Eisenstein, A. S., 64
Electrode potentials, 304
Electron trap, empty, 324
filled, 323
Emission, 284
Emission defects, 221, 223
Emission model, 330
Emission noise, electron, 221, 223
primary, 184, 186
secondary, 181
total, 170, 172
Emitter, 333
Emitter admittance, 335
Emitter current, 334
Enander, B. N., 299
Ensemble average, 116
Epstein, P. S., 2
Equivalent current generator, 46
Equivalent electrode, 54
Equivalent emf, 46
Equivalent grid-noise conductance, 168
Equivalent noise circuit, 155, 191–193, 326
Equivalent noise conductance, 188, 189
Equivalent noise resistance, 46, 48, 52, 58, 189, 207
measurements of, 175
screen-grid tube, 180
triode, 160, 161
Equivalent π and T representations of active network, 47
Equivalent potential, 54
Equivalent saturated diode current, 46, 48, 52, 59, 315

Equivalent work-function fluctuations, 73
Exponential gun, 259
Exponential line, 249
Exponential region, 51
Exponential transformer, 248, 259, 266

Farnsworth, H. E., 171, 172
Fassett, J. R., 318
Fast wave, 91, 100
Feedback, 202, 203
Feldman, W. L., 400
Ferris, W. R., 168
Field, L. M., 78, 241
Filter helix, 276, 298
Flicker noise, 45, 75, 183
  anomalous, 45, 67
  area considerations in, 58
  bias considerations in, 59
  diode, 50
  due to inhomogeneity, 59
  pentode, 55
  photoemission, 58
  photomultiplier, 57
  scaling of, 62
  Schottky's theory of, 49, 69
  secondary-emission, 56
  surface-layer mechanism of, 74
  surface-pore mechanism of, 71
  triode, 53
Flicker-noise resistance, 53
Fluctuations, concentration, 313, 314
  diffusion, 326
  majority-carrier density, 317
  minority-carrier density, 318
Fluorescent-tube noise source, 214
Fonger, W. H., 365, 373, 375, 383, 384, 393, 395
Force equation, 82, 83
Fourier analysis, 49
Fourier coefficients, 190
Fowler, P. H., 403
Fränz, K., 135
Fraser, D. B., 163
Free time, 316
Fried, C., 125, 140, 141, 284
Friis, H. T., 135, 196, 203
Fry, T. C., 2, 231

Gadsden, C. P., 201
Gain, actual power, 113
  available power, 203
  transducer, 114
Gaussian distribution, 321
Gauss's law, 84
Gebbie, H. A., 318
Giacoletto, L. J., 340, 360, 370, 402
Gianola, U. F., 401
Gisolf, J. H., 316, 318
Graffunder, W., 67
Greisen, K., 394
Grid-control tubes, 154
Grid noise, 166, 173, 174, 176
  high-frequency, 166
  induced, *see* Induced grid noise
  negative, 171
Growing noise, 283
Guggenbühl, W., 363
Guillemin, E. A., 105
Gurevich, J., 316–318

Haeff, A. V., 78, 222
Hahn, W. C., 81, 98, 233, 248
Hamilton, D. R., 78
Hannam, H. J., 58, 63, 66, 75, 315
Hanson, G. H., 340
Harris, W. A., 2, 26, 31
Harrison, S. W., 224, 225
Haus, H. A., 80, 81, 88, 114, 129, 133, 139, 141, 145, 149, 220, 224, 225
Hayner, L. J., 182
Hermitian conjugate, 106
Hernquist, K. G., 222
Herzog, G. B., 320
Higher-order beam modes, 228, 233, 269, 298
Hill, J. E., 320
Hole concentration, equilibrium, 325
  excess, 325
Holes, 319
Hsieh, Hsung-Cheng, 81
Hughes, R. D., 293

Ideal gun, 239
Impedance transformation, 238
Inco, 65
Induced grid current, 167
Induced grid noise, 166, 176
  correlated component of, 169

Induced grid noise, measurements of, 175, 212
  operating conditions in, 176
  uncorrelated component of, 170
Induced partition noise, 171
Infinite-parallel-plane beam, 83
Input capacitance, 169
Input conductance, 168
Interception current, 271
Interface resistance noise, 63, 183
Intrinsic material, 319
Intrinsic semiconductors, 323
Inuishi, Y., 74
Invariant, 119, 130
Ion bursts, 69
Ion emission, 67
Ion noise, 184, 186
Ion-oscillation noise, 222
Ion sink, 68
Island effect, 53, 61
Isolators, 299

Jansen, C. G., 71
Jen, C. K., 164
Johnson, J. B., 45, 49, 159
Jonker, J. L. H., 182
Junction, rectifying, 64
Junction admittance, 330
Junction characteristic, 329
Junction diode, 328, 332
Junction noise, 328, 332

Kane, E. O., 71
Kaplon, M. F., 403
Kinetic power density, complex, 96
  real, 88
Kinetic voltage, 85, 96
Kleen, W., 78
Kleijnen, P. H. J. A., 8
Klystron, 78
Knechtli, R. C., 265, 269, 278
Knipp, J. K., 78
Knol, K. S., 162
Kompfner, R., 78, 162, 222, 224
Kromhout, O. M., 220, 223
Kuper, J. B. H., 78
Kurrelmeyer, B., 182

Langmuir, I., 2, 8, 10, 231
Lee, Y. W., 115
Lempicki, A., 182
Lens effect, 278
Lifetime, atom, 49
  hole, 325
  pair, 347
Lindemann, W. W., 63, 65, 67, 70
Linder, E. G., 398
Llewellyn, F. B., 2, 24, 87, 94, 162, 164, 169, 243
Lock, W. O., 403
Loferski, J. J., 395, 398, 400
Log-normal distribution, 65
Longitudinal-beam amplifiers, 78
Loosjes, R., 71
Loss coefficient, 297
Louisell, W. H., 101, 112
Low-noise traveling-wave tubes, 302ff.
L-type matrix cathode, 286

McAfee, K. B., 394
MacDonald, D. K. C., 35
Machlup, S., 324
McKay, K. G., 394, 395
Macnee, A. B., 171, 172, 201
Magnesium nickel alloy, 65
Matrix, column, 105
  general-circuit-parameter, 105
  identity, 106
  inverse, 107
  nonsingular, 107
  parity, 112
  permutation, 106
  scattering, 113
Matrix cathode, 285
Maxwellian distribution, 1, 6, 34, 80
Mean-square fluctuation, 19, 117
Measurement, of correlation, 212
  of equivalent noise resistance, 175, 207
  of induced grid noise, 175, 208, 209, 212
  of noise, 204, 288
  of noise figure, 213, 292
  of partition noise, 208
  of shot noise, 206
  of space-charge reduction factor, 206
  of tube noise, 204
Mihran, T. G., 222
Mobility, ambipolar drift, 318

Modified exponential gun, 261, 301
Monte Carlo method, 38
Montgomery, H. C., 320, 382, 400
Montgomery, H. G., 338, 340
Moshman, J., 38
Mott-Smith, H. M., 80
Muehe, C. E., 141
Muirhead, H., 403
Müller, J., 97
Müller, R., 241
Multistep process, 316
Multivelocity flow, 2, 3
Mumford, W. W., 214
Mungall, A. G., 297

Nergaard, L. S., 64, 71, 73, 222, 315
Nickel alloy, active, 63
  passive, 65
Nielsen, E. G., 48
Noise, additional, 270
  bulk-resistance, 184
  cathode, 183
  circuit representation of, 188
  coating-resistance, 184
  diffusion–recombination, 344, 357
  equivalent conductance, 188, 189
  equivalent diode current, 189
  equivalent resistance, 46, 48, 52, 58, 175, 189, 207
  flicker, *see* Flicker noise
  grid, *see* Grid noise
  growing, 283
  high-frequency, 157, 161
  interface, 63
  ion, 184, 186, 222
  irradiation, 344, 394
  junction 328, 332
  leakage-conductance, 184, 186, 187
  measuring setup for, 295
  partition, *see* Partition noise
  secondary-emission, 222
  shot, *see* Shot noise
  thermal, 159, 311, 344, 361
  transistor, 344
  wall-charge, 184, 187
  white, 345, 361, 391
  $1/f$, 312
  $1/f$ leakage, 344, 375, 393
  $1/f$ surface, 344, 365, 391
Noise-cancelation schemes, 78
Noise-current measurements, 288
Noise-current smoothing, 229
Noise diode, 206
Noise factor, 307, 362, 376, 378, 388, 401
  measuring method for, 293
Noise figure, 135, 196, 225, 340
  average, 204
  cascaded-stages, 203
  excess, 297
  measurement of, 213, 293
  optimum of, 202
  spot, 135, 196
Noise impedance, 237
Noise ratio, 46, 47, 331
Noise resistance, 315
Noise source, 214, 290
Noise standing-wave ratio, 125
Noise velocity, *see* Velocity
Noise wave matrix, 130
Noisiness, 78, 144, 221, 287, 295
Normalized wave amplitudes, 92, 101, 108
North, D. O., 2, 21, 26, 31, 158–160, 162, 168, 177, 186, 229, 271, 325, 360, 365
Nyquist, H., 130, 159
Nyquist formula, 130, 331

Olson, A. B., 297
One-dimensional beam, 80, 111
Overbeek, A. J. W. M. v., 182

Parallel-flow diode, 243
Parseval's theorem, 163
Partition noise, 56, 79, 177, 274, 338
  induced, 171
  measurement of, 208
  negative grid, 171
Partition-noise resistance, 65
Paschke, F. E., 235, 298
Pearson, G. L., 400
Pedersen, N. E., 393
Peter, R. W., 88, 93, 105, 128, 133, 145, 222, 224, 225, 236, 240, 243, 248, 263, 270, 276, 284, 293, 297–299
Peters, B., 403
Peterson, L. C., 2, 24, 34, 87, 97, 162, 164, 166, 169, 189, 243

Petritz, R. L., 325
Pfann, W. G., 398
Pierce, J. R., 14, 21, 34, 78, 101, 112, 123, 128, 139, 145, 182, 221, 222, 224, 236, 297
Plasma frequency, 86
  reduced, 105
Plasma frequency reduction factor, 99, 233
Plasma oscillations, 224
Plasma transit angle, 103
Plate noise, 161
Poisson distribution, 49, 58, 318
Potential minimum, 229, 260
Power, electromagnetic, 97
  kinetic, 96
Propagation constant, 325
  electronic, 86
  plasma, 86
  reduced plasma, 99
Pulsed cathode emission, 66

Quate, C. F., 80, 140, 288

Rack, A. J., 19, 24, 34, 123, 157, 158, 162
Ramo, S., 81, 98, 164, 233, 248
Random numbers, 38
Rappaport, P., 395, 398, 400
Recombination centers, 320
Recombination fluctuations, 326
Reflected electrons, 52, 159, 170, 171
Resistance, base, 333
  base-lead, 347
  bulk, 183
  fluctuations in, 313
Resistive-wall amplifier, 78
Reynolds, H. L., 403
Rice, S. O., 14, 163
Rigrod, W. W., 284
Rippled-stream amplifier, 78
Rippled-wall amplifier, 78
Ritson, D. M., 403
Robinson, F. N. H., 2, 35, 81, 114, 129, 133, 139, 141, 145, 149, 220, 222, 224, 225, 229
Rogers, D. C., 297
Rossi, B., 394
Rothe, H., 172, 190, 192
Rowe, H. E., 125
Ruetz, J. A., 222, 276, 297

Saito, S., 43, 149
Saturated region, 50
Schottky, W., 14, 45, 49, 50, 154, 156, 158, 177, 182
Schremp, E. J., 168, 203
Schwantes, R. C., 58
Secondary current, 224
Secondary electrons, 275, 299
Secondary emission, 181
Semiconductor n-type, 312
Shive, J. N., 398, 400
Shockley, W., 182, 314, 329, 334, 345, 346
Shot noise, 1, 14, 15, 45, 123, 225, 292, 312
  diode, 50
  high-frequency, 157, 161
  measurement of, 206
  photo-emission, 58
  pure, 117
  reduced, 26
  space-charge-limited, 158
  temperature-limited, 156
Shot-noise ratio, 319
Shot-noise resistance, 52
Siegman, A. E., 42, 81, 123, 149, 224, 229, 232
Single-step process, 316
Single-velocity approximation, 34, 80
Slater, J. C., 78, 277
Slocum, A., 400
Slow wave, 91, 100
Small-signal theory, 80
Smith chart, 251, 259
Smoothing factor, 20
Smullin, L. D., 40, 125, 141, 243, 284
Smyth, C. N., 172
Source conductance, optimum, 202
Space-charge, control tubes, 78
  fringing fields, 99
  parameter ξ, 243
  reduction factor, 159
  suppression, 50, 72
  suppression factor, 51
  waves, 83
Space-charge-limited, diode, 229
  noise, 161
  region, 1, 51
Space-charge modes, 98
  dominant, 98

Space-charge-wave amplifier, 78
Space-charge-wave transformers, 241
Spangenberg, K. R., 54
Spectrum, cross-power density, 117
  power, 163
  self-power density, 50, 117
Spenke, E., 157, 158
Stahmann, J. R., 169, 200, 213
Standards on Electron Devices: Methods of Measuring Noise, 196
Standing-wave ratio, 226
Strutt, M. J. O., 201, 203, 363
Surdin, M., 316, 318
Surface recombination velocity, 347, 365
SWR detector, 288
Synchronously gated receiver, 288

Talpey, T. E., 171, 172
Temperature, electron, 297
Temperature-limited diode, 14
Temperature-limited region, 1
TEM waves, 85
Thermistor, 205
Thermocouple, 205
Thompson, B. J., 2, 8, 26, 31, 159, 186
Three-region gun, 263, 301
Tien, P. K., 2, 38, 78, 81, 149, 224, 229, 232, 241
Titchmarsh, E. C., 163
Tobin, N., 403
Tomlinson, T. B., 56, 61
Torrey, H. C., 332, 333
Transducer, 236, 240
Transformer, 240
Transistor, equivalent circuit of, 336, 338
  junction, 333
  n-p-n, 333
  p-n-p, 333
  surface-barrier, 339
Transit angle, 34
  fluctuations in, 170
  plasma, 103
Transit-time conductance, 168
Transmission defects, beam-, 222, 224
Transmission line, analogy of, 325
Transmission line, model of, 236
  tapered, 103
  theory of, 240
Transverse-field traveling-wave tubes, 220
Transverse velocities, 279
Trap, electron, empty, 324
  filled, 323

Valley, G. E., 204, 205, 213
Van Alkemade, C. Th. J., 58
Van der Ziel, A., 11, 48, 50, 58, 63–65, 67, 70, 71, 73, 162, 164–166, 169, 170, 183, 196, 200–203, 207, 312–314, 316, 318, 320, 325–327, 330, 331, 340–342, 360, 398
Van Leeuween, C. J., 67
Van Roosbroeck, W., 398
Van Vliet, K. M., 50, 67, 320
Van Wijngaarden, J. G., 50, 67
Velocity, average, 7
  emission, 4
  fluctuations in, 165
  group, 91, 101
  noise, 256
  single, 2
  transverse, 279
Velocity-jump gun, 256
Versnel, A., 172
Volkers, W. K., 393

Wade, G., 149, 259
Walker, L. R., 80
Wallman, H., 201, 204, 205, 213
Watkins, D. A., 2, 35, 42, 78, 80, 81, 123, 149, 224, 229, 231, 232, 256
Wavelength, electronic, 100
Webster, H. F., 222
Weisskopf, W. F., 330
Whinnery, J. R., 2, 37, 78, 224, 229
Whitmer, C. A., 332, 333
Williams, R. C., 78, 159

Yang, T. C., 74

Zernike, F., 317, 322, 324
Ziegler, M., 182