
Index

- 3D analysis, *see also* three-dimensional analysis 235
- 3D rapid prototyping 245
- β -function 373
- π -mode 56, 362
- A
- Abbe's law 106
- aberration 159, 214
 - coefficient 160
- absolute pressure 500
- absorber 401
- absorption 308, 345, 487
 - coefficient 306, 346
 - cross-section 306
- AC memory type dot matrix display 112
- accelerating voltage 239
- accelerator 232
 - collider 365
 - structure 362
 - vacuum system 357, 387, 394, 403
- accelerator mass spectrometry (AMS) 236
- acrylic layer 108
- active cathode surface 446
- active gauge 504
- Adler relationship 5
- adsorption 487, 494
- alkali based emitter 449
- alkali based photo cathode 450
- alkali metal dispensers (AMD) 469
- alkaline earth metals 478
- alkaline earth oxides 477
- alternating gradient focusing 373
- amplifier 1, 6, 46
 - channel 132, 153
 - harmonics 52
 - large gain 3
 - three stage image 139
- amplitron 59
- analogue display 91
- analogue grey scale generation 95
- anisotropic astigmatism 159
- anisotropic coma 159
- anisotropic distortion 159
- anode 5, 11, 43, 55, 57, 60, 118, 156, 164, 409, 429, 433, 475, 493, 502, 516, 518
 - current 5
 - dark current 133
 - efficiency 286
 - potential 60
 - surface 413
 - voltage 11, 102, 118, 433, 461, 463
- anodic bonding 470, 473
- anticorona ring 19
- aperture 157, 217
 - lens 164
- Applegate diagram 14, 38
- arc
 - constriction 411
 - movement 409, 410
 - stability 409
 - welding 174
- aspherically polished X-ray mirror 348
- astigmatism 157, 162, 206
- atomic absorption 338
- atomic absorption spectroscopy 338
- Auger
 - effect 343
 - electron 207
 - electron emission 189
- avalanche cold cathode (ACC) 450, 463
- axial aberration 191
- axial astigmatism 159, 214
- axial chromatic aberration 191, 214
- axial electron gun 174
- axial gun 181

- axial magnetic field (AMF) 411, 417, 419, 420
 - arc 413
 - contact 411, 412, 419, 426
- axial output coupling 71
- azimuthal electron bunching 62
- azimuthal phase bunching 64

- B
- Ba based thermionic cathode 449
- Ba getter 492
- Ba-dispenser cathode, *see also* I cathode 439
- back-scattering coefficient 172
- backscattered electron detection 174
- backscattered electrons (BSE) 206
- backward wave amplifier 52
- backward wave oscillator (BWO), *see also*
 - carcinotron 2, 52
 - M-type BWO (MBWO) 2, 53, 54, 60
 - O-type BWO 53, 54
- ballistic electron emission 465
- bandwidth 1, 6, 12, 22
- BaO evaporation 446
- barrier junction target 147
- Bayard–Alpert gauge 394
- beam
 - aperture 172
 - deflecting system 143, 145
 - deflection 174, 181, 200
 - density 364
 - diameter 239
 - dynamics 369
 - efficiency 43, 44
 - emittance 369
 - focusing system 143, 145
 - lifetime 379, 380
 - loading conductance 16
 - power efficiency 29, 43, 295
 - screen 400
 - transport 250, 254
 - self-pinched 259
 - vacuum chamber 401
 - vacuum system 393, 397
- beam forming region (BFR) 107
- beam-gas lifetime 383
- bending magnet 401
- Bernas source 248
- betatron 363
- accelerator 364
 - tune 374
- bipotential electron gun 102
- bipotential lens 102
- black body radiation 303, 335
- blended-light-lamp 333
- bone densitometry 349
- borosilicate glass 510
- breaking capacity 414
- Bremsstrahlung 179, 344
 - interaction 381
- Brewster angle windows 72, 310, 311
- brightness 168, 170
 - efficiency 107
- brilliance 369
- Brillouin flow 32
- bulk desorption rate 509
- buried layers 252
- Busch theorem 8

- C
- candescent emitter 458
- capacitance manometer 500
 - gauge 500
- carbon nanotube (CNT) 125, 451, 456, 461
 - emitter 277
 - FED 462
- carcinotron 3, 60
- cathode 20, 30, 55, 57, 118, 122, 155, 164, 430, 493, 502, 506, 516, 519
 - auxiliary 167
 - boride 446
 - borided tungsten 438
 - cold 4, 58, 60, 82, 451
 - cold field emission 454
 - emission 9
 - hot 24, 503, 506
 - lanthanum hexaboride 448
 - long-life 436
 - material 456, 461, 493
 - nanotube 463
 - ray 184, 429
 - oscilloscope 155
 - rod 166
 - surface 10, 26, 29, 33, 436, 477
 - thermal 168, 171
 - virtual 433
- cathode ray tube (CRT), *see also* electron
 - beam tube 85, 86, 100, 492
 - monitor 91

- ceramic window 35
 - cesium 272, 278
 - ions 272
 - CF flange 512
 - channel implants 249
 - channel multiplier 136
 - channel plate 136, 137, 140
 - channel secondary electron multiplier 134, 135
 - channeling 246, 247, 250, 252
 - character display 88
 - Chebyshev step transformer 35
 - chemically amplified resists (CAR) 193
 - Cherenkov radiation 315
 - Child–Langmuir law 11
 - chopping current 414, 416
 - chromatic aberration 159, 160, 210
 - chromatic aberration coefficient 166
 - circuit editing (CE) 237, 243
 - clean metal work function 434
 - coaxial electrode 55
 - coaxial magnetron 3
 - coaxial output transition 35
 - Cockroft–Walton generator 357
 - coefficient of spherical aberration 214
 - coherent radiation 63, 357
 - cold bore vacuum system 393, 399
 - cold field emitters 168
 - collector 3, 19, 24, 60, 506
 - efficiency 39, 41, 43, 44
 - collider 370
 - colloid thruster 272
 - colour 96
 - capability 95
 - rendition 327, 331
 - coma 162
 - combination gauge 504
 - compression ratio 496
 - Compton effect 346
 - Compton scattering 384
 - computer-controlled vacuum interrupters (CCVI) 426
 - condenser aperture 211
 - condenser lens 165, 211
 - conflat flange 512
 - conical hollow beam 293
 - contact stroke 410, 412, 416, 423
 - contact welding 414
 - continuous flow 485
 - continuous wave (CW) tubes 1
 - contrast ratio 93, 94
 - of the screen 108
 - convergence factor 26
 - corona discharge 342
 - correcting lenses 162
 - coupling coefficients 16
 - coupling factor 57
 - critical dimension (CD) 193, 238
 - critical energy 377
 - cross-field amplifier (CFA) 2, 47, 55, 58, 61
 - cross-linking of polymers 202
 - cross-over projection method 171
 - crossed-field ion gauge, *see also* Penning gauge 501
 - crossover 102, 166, 171, 206, 211
 - cryopump 491
 - crystal damage 247
 - Cs on W 449
 - CsAu compound 450
 - CTEM 160, 216
 - curing of laminate materials 202
 - curing organic materials 198
 - current 407
 - amplification 136
 - density 9, 239, 324, 413
 - limitation 40
 - Cutlers beam 36
 - cutoff wavelength 361
 - CVD carbon nanotube gated cathode 461
 - CVD-diamond window 71
 - cyclotron 359
 - classical 359
 - frequency 359
 - harmonic operation 66
 - interaction 65
 - cyclotron autoresonance maser (CARM) 67, 68
- D
- damping time 378
 - dark current 147
 - de Broglie wavelength 355
 - deactivation curves 203
 - deceleration 4, 27, 37, 251
 - zone 37
 - decoding matrix 141
 - deep space communications 81

- deflection 157
 - aberration 163
 - amplifier 90
 - angle 104, 157, 186
 - astigmatism 157
 - coils 157
 - coma 157
 - error 164
 - field 163
 - sensitivity 157
 - system 195, 216
 - delay line 27
 - comb line 34
 - counter wound double helix 34
 - coupled cavity 34
 - helix 33
 - interdigital line 34
 - ring and bar line 34
 - system 33
 - Delta gun 108
 - depressed collector 29, 71
 - depth profiles 247
 - depth profiling 236
 - depth resolution 233
 - desorption, *see also* outgassing 486, 487, 509, 515
 - yield 384
 - detection of THz radiation 322
 - deuterium lamp 335, 336
 - diamond cathode 460
 - diamond hopping electron emitter 459
 - diaphragm pump 489
 - dielectric barrier discharge (DBD) 341
 - dielectric strength 414, 415, 420, 423
 - differential pressure 500
 - differential pump 494
 - diffraction 308
 - aberration 162
 - error 159
 - diffuse AMF arc 413
 - diffuse burning arc mode 411
 - diffusion 493, 494, 499
 - pump 483, 490
 - rate 493
 - digital display 91
 - digital grey scale generation 95
 - digital mirror devices (DMD) 95
 - dipole magnet 372
 - directed vapor deposition 155
 - discharge 265, 266, 307, 324, 450
 - chamber 265
 - channel 279, 283, 291, 312
 - dispenser cathode, *see also* film cathode 10, 166, 436, 477
 - dispersion diagram 65, 67
 - display quality 93
 - dissociative recombination 338
 - distortion 157
 - divergence 376
 - doping 246, 249
 - Doppler effect 65
 - Doppler shift term 63, 67
 - double deflection system 206
 - double focusing mass spectrometer 516
 - dragfree satellite 274
 - drilling 171
 - rate 177
 - systems 166
 - droplet sprayer 272
 - dual potential test method 221
 - Duane–Hunts law 344
 - ductility 436, 475
 - duoplasmatron 165
 - dynamic astigmatism 107
 - dynamic pressure 385
 - dynamic SIMS 235
 - dynamic vacuum 383
 - dynode 132, 134
- E
- e-beam 156, 172, 179, 192
 - accelerator 189
 - disinfection 188
 - evaporation 156, 181
 - fusing 178
 - glowing 178
 - hardening 178
 - high rate evaporation 182
 - liquid phase processes 178
 - machining 171
 - melting 166, 188
 - probing system 220, 221
 - scanner systems 189
 - sterilization 188
 - treated surface 181
 - welding 156, 163, 166, 168, 174, 175
 - writers 195
 - Ebsicon 148

- effective contact surface 410, 412
 effective ion beam angle 295
 effective work function 443
 efficiency 1, 12, 18, 46, 70, 72, 99
 Einstein coefficients 304, 306
 Einstein equation 128
 Einstein's equivalence principle 274
 Einzel lens, *see also* bipotential lens 102
 elastic scattering 343, 380
 electric deflection system 131
 electric electron lens 131
 electric propulsion (EP) 288
 electrical charge distribution 146
 electrical lifetime 421, 422, 424
 electrical visible light sources 322
 electrically charged quartz filament 152
 electro chemical machining 176
 electro discharge machining 176
 electro welding, *see also* arc welding 174
 electro-magnetic interference (EMI) 98
 electron beam 4, 24, 59, 79, 92, 101, 130, 131, 139, 145, 146, 149, 241, 313
 electron beam cold-hearth refining (EBCHR) 185
 electron beam collector 39
 electron beam curing (EBC) 199, 200
 electron beam drilling machine 177
 electron beam drip melting technology 185
 electron beam (EB), *see also* e-beam 155, 156
 energy recovery 79
 melting (EBM) 185
 photo mask 198
 projection (EBP) 195
 spectroscopy 218
 treatment 205
 electron beam-induced deposition (EBID) 195, 198, 456, 457
 electron beam-induced etching (EBIE) 195
 electron beam-induced processes (EBIP) 188, 195, 198
 electron-beam drilling 156
 electron-beam lithography 157, 191, 192, 195
 electron bombardment ion thruster (EIT) 269, 289
 electron bombardment ionisation principle 265
 electron bunching 4, 13
 electron cyclotron frequency 63
 electron cyclotron heating (ECH) 72
 electron cyclotron maser (ECM), *see also* gyrotron 62
 applications 49
 electron emission 429, 450, 452, 467, 473
 cooling effect 434
 current 503
 electron energy loss spectroscopy (EELS) 218
 electron gun 4, 24, 60, 102, 144, 165, 166, 171, 211
 electron lens 159
 electron linear accelerator 81, 399
 electron microscope 156, 209, 214
 electron optical lens 164, 217
 electron optical system 161
 electron optics 128, 131, 155, 157, 164, 191
 electron plasmon excitation 189
 electron source 429, 449, 451, 456, 473, 477
 electron spatial density modulation 15
 electron storage ring 379
 electron-positron collider 78
 electronic counter measurement (ECM) 25
 electrooptical high-speed shutter 139
 electrostatic collector 41
 electrostatic deflection 86, 103, 146
 field 157
 electrostatic Einzel lens 162
 electrostatic focusing 170
 electrostatic lens 140, 192
 electrostatic microscope 165
 electrostatic scanning 248
 emission current 430, 434, 452, 453, 463, 466, 519
 density 10, 168, 430, 437, 438, 441, 442, 454, 461, 466
 emission display 517
 emission of electrons 9, 10
 emission spectrum 107, 336
 emissive displays 87
 emittance 369
 emitter materials 477
 emitting-cathode ionisation gauge, *see also* hot-cathode gauge 503
 energy contamination 251
 energy dispersive spectroscopy (EDS) 218

- epoxy bonding 471
 - equilibrium emittance 371
 - equivalent noise input 133
 - erasing discharge 115
 - European Space Agency (ESA) 286
 - European Space Research and Technology Centre (ESTEC) 272
 - eutectic bonding 473
 - evaporable getter (EG) pump 492
 - evaporation 156, 169, 171, 200, 436, 490, 515
 - rate 469
 - excimer laser 311, 313, 340, 342
 - tube 312
 - excimer light source 338
 - excitation energy 305, 328, 335
 - excited dimer 311
 - extended interaction klystron (EIK) 50
 - extended interaction oscillator (EIO) 50
 - external photoelectric effect 127
 - extraction aperture 165
 - extreme ultra violet lithography (EUVL) 193
 - extreme UV (EUV) 335, 348
 - extremely ultrahigh vacuum (XHV) 485
- F**
- far infrared (FIR) 317
 - far ultraviolet (FUV) 334
 - Faraday cup 251
 - fast wave circuit 62
 - fast-wave device 61
 - ferroelectric electron emission 467
 - field electron emission 454, 460
 - field emission cathode 451, 457
 - field emission current density 415
 - field emission display (FED) 87, 122, 451, 452, 464
 - field emission electric propulsion (FEED) 272, 274, 278, 288, 296
 - field emission microscope 156
 - field emission SEM system 209
 - field emitter array (FEA) 457
 - field evaporation 273
 - field-emission measurement chamber 517
 - filament temperature 499
 - film cathode 436
 - finite element method 158
 - fixed target 365
 - flat diode lamp 463
 - flat panel display (FPD) 85, 89, 91
 - flicker 90, 122
 - fluorescent coating 326
 - fluorescent lamp 325, 326
 - fluorescent screen 139
 - focal length 155, 159, 165
 - focused ion beam (FIB) 236, 237, 245, 273, 457
 - focusing coil 145
 - focusing magnetic lenses 174
 - focusing system 27
 - FODO lattice 373
 - folded waveguide 54
 - frame rate 90
 - frame time 89, 99
 - free electron laser (FEL) 62, 315, 317, 356, 368, 403
 - pulse 316
 - free-electron maser (FEM) 62, 70, 78
 - amplifier 79
 - oscillator 79
 - Fresnel zone plate 348
 - fusion bonding 471, 473
- G**
- gain 1, 12, 18, 27
 - Gamma camera 141, 153
 - gas
 - discharge 164, 501
 - laser 307
 - loading 509
 - poisoning 430, 439
 - pressure 485, 499
 - gaseous discharge (plasma) 324
 - gaseous propellant 289
 - gauge 497
 - sensitivity 503
 - Gaussian mode 72
 - Gaussian phase space distribution 375
 - Geiger–Mueller counter 150, 219, 346
 - Geiger–Mueller mode 150
 - Geißler tubes 429
 - geometrical aberration 159, 161
 - geometrical electron optics 155
 - getter 438, 472, 492
 - material 469, 472, 474, 493
 - glass frit bonding 471, 473
 - glow discharge device 340

grey scale 94
 grid ion thruster (GIT) 288
 grid voltage 118
 gridded electron gun 3
 gyro-amplifier 74
 gyro-backward wave oscillator (gyro-BWO) 66, 68, 78
 gyro-klystron 66, 75, 76
 gyro-travelling wave tube (gyro-TWT) 66, 68, 69, 75
 gyro-twystron 66, 75, 77
 gyrotron 4, 62, 66, 70, 72
 cathode 10
 oscillator 66, 67, 72, 75
 for industrial applications 74

H

hairpin cathode 167
 Hall effect thruster (HET) 278, 288
 halo implants 252
 harmonic frequency gyrotron 67
 Hartree line 58
 head-up-displays (HUD) 111
 helium leak detector 516
 helium sniffer 517
 helix 27
 helmet-mounted-displays (HMD) 111
 HERA accelerator 356, 366
 hibachi foil 314
 high current cathode 171
 high efficiency multistage plasma thruster (HEMP-T) 288, 293
 high energy ion scattering (HEIS) 236
 high energy linear induction accelerator (HELIA) 254
 high pressure gauge 394
 high resolution 102, 105, 121
 electron microscope 210
 lens 159
 high voltage vacuum breakers 423
 high voltage vacuum interrupter 424
 high-power electron gun 184
 high-pressure discharge lamp 324, 329
 high-pressure mercury lamp 330
 high-pressure sodium lamp 329
 highly relativistic beam 67
 HIP cathode 446
 hollow cathode arc activated (HAD) 184

hollow cathode lamp 338
 hollow ion beams 292
 hollow-cathode neutralizer 266, 280, 281, 291, 293
 Holweck stage 497
 homogeneous excitation 311
 hopping electron cathode 465
 hot-cathode gauge 503
 Hull parabola 58

I

I cathode, *see also* Os/Ru coated impregnated (I) cathode 431, 439, 476
 ideal gas law 484
 ideal quadrupole field 372
 image amplification factor 139
 image converter 139
 imaging 233
 lens 210, 216
 SIMS 235
 imperfection aberration 163
 impuls per propellant weight 294
 impulse rise time 136
 In-Line gun 108
 in-vacuum undulator 402
 incandescent lamp 322, 323, 436
 indium thruster 273
 indium tin oxide (ITO) 144
 induction linac 79
 inductive output tube (IOT) 3, 22
 inelastic scattering 343, 381, 383
 inertial confinement fusion (ICF) 179
 inertial fusion energy (IFE) 313
 requirements 254
 infrared focal plane array technology 319
 inorganic scintillator 137
 integrated sputter ion pump 392
 interaction efficiency 5, 20, 27
 interaction of beam energy 4
 interaction process within magnetron 56
 interference telescope 274
 International Linear Collider (ILC) 363, 367
 interrupting capability 409, 410, 413, 419, 425
 interrupting current 410, 419, 425
 ion beam 242
 analysis 232
 energy distribution 281

- ion bombardment (IB) 430, 440
 - resistivity 441, 443
 - ion current 409, 502, 503
 - ion emitter array 277
 - ion implantation 238, 247
 - ion implanters
 - batch 248
 - high-current 251
 - ultra-low energy 250
 - ion laser 310
 - ion scattering spectroscopy (ISS) 236
 - ion source 237, 248
 - contaminants 258
 - field emission 258
 - space charge limited 258
 - ion-induced deposition process 240
 - ion-induced desorption 385
 - ionisation
 - chamber 150, 151, 506
 - constant 345
 - dose 345
 - efficiency 295
 - iron yoke magnet 361, 399
 - ISM applications 81
 - isochronous cyclotron 359
 - isotropic astigmatism 159
 - isotropic coma 159
 - isotropic distortion 160
- K
- klystron 2, 12, 14, 47, 48, 74
 - amplifier 12
 - cavity 15
 - reflex 3
 - tunable 3
 - two cavity 50
 - Knudsen flow 486
- L
- L-cathode 431
 - LaB₆ evaporation rate 447
 - LaB₆ rod cathode 168
 - ladder circuit 51
 - laminar flow 485
 - lanthanated molybdenum (LM) cathode
 - 438
 - Laplace equation 8
 - large electron-positron collider (LEP) 376, 385
 - vacuum chamber 392
 - Large Hadron Collider (LHC) 367
 - large signal operation of the TWT 37
 - light amplification by stimulated emission of radiation (laser) 307
 - ArF 337
 - argon ion 310
 - ablation deposition (LAD) 442
 - beam drilling 176
 - cell 313
 - CO₂ 308
 - continuous wave (cw) 308
 - diode 321
 - discharge pumped 310
 - He-Ne 309
 - KrF 313
 - medium 307, 308, 310
 - mirror 308
 - pulse duration 312
 - resonator 308
 - quantum cascade 321
 - ultraviolet nitrogen 308
 - X-ray 308, 310
 - leak detection 514
 - lens 157, 159
 - aberration 158, 161
 - field 160
 - system 214
 - lethal dose 345
 - lifetime 3, 93, 98, 99, 112, 117, 119, 166, 168, 169, 237, 286, 314, 323, 326, 328, 338, 416, 422, 447, 449
 - tests 276
 - light amplification factor 140
 - light emission 114
 - light emission spectroscopy 221
 - light penetration depth 129
 - light sensitive converter target 143
 - light wavelength 130
 - light-ion generator
 - current enhancement 255
 - diocotron instability 255
 - injector gap 254
 - ion mode instability 255
 - virtual cathode 255
 - LINAC 28
 - linear accelerator 361, 390
 - linearity 1, 25, 39, 46, 143
 - Liouville theorem 371

- liquid effluent waste 205
- liquid helium cryopump 492
- liquid metal droplet 289
- liquid metal ion source (LMIS) 243, 273
 - capillary type 274
 - needle type 274, 276
 - slit type 274
 - sources 237
 - propellant 273, 278
- lithography 170
- Littrow prism 311
- local oscillator 54
- local thermal equilibrium (LTE) 324
- Lorentz force 372
- low energy electron flood gun 241
- low energy ion scattering (LEIS) 236, 441
- low vacuum (LV) 485, 500, 505, 510, 517
- low voltage circuit breakers 422
- low-pressure discharge lamp 324
- low-pressure mercury lamp, *see also*
 - fluorescent lamp 325
- low-pressure neon lamp 328
- low-pressure sodium lamp 328
- low-resolution display 90
- lumen sensitivity 129
- luminance 93, 97, 98, 119
- luminosity 366
- luminosity lifetime 382

- M**
- M cathode 431
- M-carcinotron 54
- magnet cryostat 399
- magnetic bearing turbopump 497
- magnetic deflection 90, 155
 - mass spectrometer 506
 - of electron beam 104
 - system 105, 132
- magnetic electron lens 131
- magnetic focusing 31, 146
- magnetic lens 155, 158, 192, 216
- magnetic-focus-lens electron gun 103
- magnetically focused collector 42
- maser 2, 24, 47, 55, 81
 - efficiency 58
 - injection gun 70
 - oscillator 59
 - pump 494
- maser 62, 307
- mask repair (MRP) 237
- mass absorption 345
- mass spectrometer helium leak detector 506, 515
- matrix drive 89, 90
- maximum amplification factor 140
- maximum current amplification 134
- Maxwell equations 7
- mean time to failure (MTTF) 408, 427
- mechanical lifetime 421, 424
- medium energy ion scattering (MEIS) 236
- medium vacuum (MV) 485, 505
- medium voltage range 407, 409, 420, 426
- melting 156, 171
 - point 178, 181, 435, 449, 475
 - temperature 412
 - zone 185
- MEMS 277
- mercury arc lamp 337
- mercury diffusion pump 483
- mercury-free metal halide lamp 333
- metal halide lamp 329, 331
- metal-insulator-metal-insulator-vacuum (MIMIV) device 459
- micro-hollow-cathode (MHC) discharge 342
- microfabrication 277
- MicroPirani gauge 499
- micropropulsion 275, 277
- microscope 156
- microspacecraft 274
- microthruster 274, 275
- microwave ovens 81
- microwave tube 1, 10, 24, 45, 62
- microwelding 174
- mixed matrix Scandate cathode 441
- Mo-brightness 442
- mode of propagation 1
- modulating cavities 19
- modulation transfer function (MTF) 98
- modulations and energy extraction 13
- MoirT effect 98
- molecular flow 486
- molecular radiator 331
- monotron oscillation 16, 22
- Monte Carlo simulations 247
- MOSFET 249
- multi-cell cavity 362
- multi-line radiator 331

- multi-pulse drilling 176
- multibeam high power klystrons (MBK) 3, 20
- multicavity klystron 3
- multicavity multigap design 50
- multiplier channel 134, 136
- multipoint explosive emission cathode 180
- multistage collector 39

- N
- nanocrystallized polysilicon (NPS) 465
- nanogetter 473
- natural radiation dose 345
- negative phase contrast 218
- neutral propellant atoms 280
- neutralizer 277, 280, 285
- Newvicon target 144
- Ni doped cathode 444
- nominal thrust 286
- non-contact e-beam testing 221
- non-evaporable getter (NEG) pump 390, 391, 492
 - coating 393
- non-thermal EB refinement 201
- non-thermal materials refining 155
- non-thermal processes for treating materials 189
- normalized emittance 371
- numerical aperture 192
- numerical indicator experimental (NIXIE) tube 86

- O
- O-ring 512
- objective aperture 211, 216
- objective lens 160, 174, 192, 206, 213
- Omegatron 506
- on-line elemental analysis 349
- one beam klystron (OBK) 20
- one-dimensional vacuum system 389
- one-shot brazing technology 408
- onset ion emission 275
- optical lithography 238
- optical proximity effect correcting structures (OPC) 239
- optical resonator 308
- organic scintillator 137
- Os/Ru-I cathode 443
- oscillator 1, 3, 47

- outgassing 487, 506, 515
 - rate 510, 511, 513
- output power 58, 312
 - optimization 18
- oxide cathode 2, 101, 167, 430, 439, 474, 477
 - alkaline earth oxide cathode 443
 - ThO₂ cathode 446
- oxygen free high conductivity (OFHC) copper 510

- P
- parasitic lens 158
- partial pressure 507
- partial vacuum 483
- particle
 - accelerator 355, 398
 - size analysis 349
 - source 364
- peak current 417
- penetrating light flux 128
- penetration depth 212, 412
- Penning gauge 502
- permanent magnet 19, 55, 74, 402
- permanent periodic magnet (PPM) 25, 42, 289, 291
- perveance 5, 9, 20, 165, 168
- PFE's screen printable cold cathode 459
- phase contrast 214
- phase lag 52
- phase space 369
- phased array antenna 81
- phased-array radar 77
- phosphor 92, 98, 122
 - grain 108
- photo cathode 128, 132, 139, 140, 148, 364, 469
- photo emission 468
- photo-effect with ionisation 346
- photo-electron emission 467
- photoconductive resistance target 143, 147
- photoelectron 128
 - current 139
 - emission 128
 - picture 139
- photomask repair (PMR) 238
- photomultiplier 132, 153
- photon emission 305
- photon energy 130, 304, 305

- photon flux 384, 385
 - photosensitive target 143
 - physical vapor deposition (PVD) 155
 - Pierce electron gun 29
 - Pierce type electron gun 13, 19, 23
 - Pierce-cathode 168
 - Pirani gauge 499
 - pixel pitch 95, 96, 98, 117
 - Planck's formula 303, 335
 - plane luminescent screen 139
 - plane photocathode 139
 - plasma discharge 165, 184
 - plasma display 112
 - plasma display panel (PDP) 85, 87, 95
 - grey scale 116
 - plasma frequency 17
 - plasma-activated CVD 438, 441
 - plasma-immersion ion implantation (PIII) 253
 - Plumbicon target 144
 - pocket dosimeter 152
 - Poisson equation 8
 - positive electron beam resist 192
 - positive ion bombardment 447
 - positron linear accelerator 399
 - post-accelerator gap
 - limiting voltage 257
 - multi-stage acceleration 256
 - virtual anode 257
 - pot depth 410, 411
 - pot diameter 410, 411
 - pot-shaped AMF contact 410, 411
 - potential depression 40
 - power 1
 - density distribution 172
 - supply 5, 98
 - transmission 81
 - practical work function distribution (PWFD) 431
 - pre-focusing lens 107
 - pressure 484
 - instability 386
 - profile 389
 - rise method 514
 - primary electron 344
 - primary electron energy 130
 - priming and data-write discharge 114
 - probe astigmatism 196
 - projected range 247
 - propellant 265, 278, 288, 297
 - for ion thrusters 265
 - gas flow 293
 - inlet scheme 283
 - ionization 280
 - efficiency 285
 - ions 280
 - mass 281
 - flow 284, 295
 - weight 294
 - proportional mode 150
 - proton induced γ -ray emission (PIGE) 234
 - proton induced X-ray emission (PIXE) 234
 - proton linear accelerator 399
 - proton microprobe 234
 - pulse wave tubes 1
 - pump 483, 487
 - pumping speed 386, 490, 495
 - purification of drinking water 205
 - Pyroelectric Vidicon 148
 - pyrolytic sandwich cathode 169
- Q
- quadrupole magnet 372, 373
 - quadrupole mass filter 506
 - quadrupole mass spectrometer (QMS) 236, 507
 - quantum counter 135
 - quantum detector 319
 - quantum efficiency 129, 130, 327
 - quasi-optical mode converter 71
- R
- radar 81
 - radar and ECM TWTs 47
 - radial current density 413
 - radial magnetic field (RMF) 409, 417, 419, 420
 - contact 412
 - system 410
 - radial output coupling 71
 - radiation damping 377, 379, 382
 - radiation emission 323
 - radiation length 381
 - radiation power 376
 - radiation sensitive vacuum electronic
 - components 128
 - radiation sensitive vacuum tube 127
 - radiation sensitivity 153

- radical-induced reactions 190
 - radioactive radiation 150
 - radiofrequency ionisation principle 266
 - radiofrequency ionisation thruster (RIT) 266, 289
 - radiography 349
 - radiometer 318
 - rapid prototyping 245
 - rare gas emission spectra 339
 - rare gas excimer light source 339
 - raster scan 89, 90
 - Rayleigh scattering 347
 - reactive evaporation 182
 - recirculator 313
 - reentrant cavity 13
 - reflection coefficient 5, 10, 99
 - relativistic equation of motion of a single electron 6
 - reliability 1, 22, 49, 289
 - repetition rates 312
 - residual gas analyser (RGA) 394, 507
 - residual gas pressure 379
 - resist bonding 471
 - resistive layer 134
 - resolution 86, 88, 91, 117
 - resolving power 143
 - resonant absorption 305
 - response time 99
 - retarding-field tube 2
 - RF gun 365
 - RGB colour system 98
 - ribbon beam 248
 - Richardson work function 442
 - Richardson–Dushman equation 10
 - Richardson–Dushman–Schottky equation 10
 - Rieke diagram 5
 - RIT 10 testflight on EURECA 268
 - RIT for commercial applications 271
 - RIT for interplanetary missions 272
 - Robinson theorem 378
 - rotary pump 390
 - rotary vane pump 483, 488
 - rotating anode 165
 - Rutherford backscattering analysis (RBS) 232
 - Rutherford scattering 380
- S
- saturation current 152, 433
 - ‘Sc’-I cathode 441
 - ‘Sc’/Re-I cathode 442
 - scalar potential 7
 - scaling 92
 - laws 9
 - Scandate cathode 431, 441, 477
 - scanning beam 149
 - scanning electron microscope (SEM) 156, 169, 196, 206, 210, 218, 221, 222, 316, 317, 449
 - scanning process 147
 - scanning system 248
 - scanning transmission electron microscope (STEM) 161, 216, 218
 - scanning tunnelling microscope 196
 - scattering absorption contrast 213
 - Schottky effect 435, 468
 - scintigrams 142
 - scintillation camera 141
 - scintillation counter 132, 137, 138, 153
 - scintillation crystal 137, 139, 141
 - screen oxides 252
 - second harmonic cavity 18
 - secondary electrons (SE) 206
 - current 130, 132
 - emission 127, 130, 132, 189, 237
 - energy spectrometry 221
 - multiplier 132
 - spectroscopy 221
 - secondary emission 128, 149, 466
 - coefficient 131, 132
 - secondary ion emission 237
 - secondary ion mass spectrometry (SIMS) 234
 - static 234
 - self-contained cryopump 492
 - semiconductor cold cathode 450
 - semiconductor device fabrication 249
 - sensitive entrance electrode 132
 - sensitivity 143
 - separate evaporation 183
 - sextupole magnet 372
 - signal amplification factor 153
 - signal-to-noise ratio 1, 133
 - silicon multidiode target 143–145
 - silicon tip avalanche cathode (STAC) 463
 - silicon-on-insulator (SOI) 250

- single contact gap 426
 - single crystal sensor 141
 - single junction diode target 143–145
 - single stage collector 28
 - single-stage rotary vane vacuum pump 489
 - slot angle 410, 411
 - slot number 410, 411
 - slotted cathode pump 494
 - small geostationary communication satellite (SGEO) 297
 - small mission for advanced research in technology (SMART) 286
 - small signal theory (Pierce) 34
 - Smith–Purcell effect 315
 - solder bonding 471
 - source/drain extension (SDE) 249
 - space charge 7, 10, 17, 18, 27, 29, 30, 134, 250, 433, 434, 442, 447, 467
 - density 8
 - field 469
 - limited current 11
 - limited emission 10
 - space materials analysis 276
 - space resolution 134
 - spacecraft charging 277
 - spacecraft contamination 273, 275
 - spatial conductivity distribution 144
 - spatial resolution 143
 - specific excimer light sources 340
 - specific impulse 266, 268, 271, 272, 278, 284, 288, 293, 297
 - specific outgassing 487
 - specific pumping speed 389
 - spectral sensitivity 133, 150
 - spectroscopy 155
 - spherical aberration 159, 214, 218
 - Spindt cathode 82
 - Spindt-type Mo cathode 123
 - spinning rotor gauge 501
 - spiral cathode 167
 - spiral contact 409
 - spontaneous emission 305
 - spot size 106
 - spotless arc deposition (SAD) 184
 - spotless arc process (SAP) 184
 - sputter ion pump 390, 391, 494
 - sputtering 234, 252
 - sputtering of atoms 237
 - anode 493
 - standing wave ratio (SWR) 5
 - Stanford Linear Accelerator Center (SLAC) 367
 - starvation effect 414
 - stationary plasma thruster (SPT) 279
 - stencils mask 197
 - step and flash imprint lithography (SFIL) 193
 - sterility assurance level (SAL) 203
 - stimulated emission 305, 308
 - Stirling cooler 319
 - streamer 341
 - strip cathode 167
 - stroboscopic imaging method 222
 - strong focusing 360, 372
 - sublimation pump 494
 - superconducting cavity 362, 402
 - superconducting magnet 361, 393
 - surface analysis 234
 - surface desorption rate 509
 - sweep signal 89
 - switching capability 409, 411, 426
 - synchro cyclotron 359
 - synchronism condition 53, 65
 - synchrotron 359
 - oscillations 360
 - radiation 348, 355, 376, 379, 395, 401–403
 - induced desorption 383
 - production 368
 - research 361, 368
 - source 356
 - spectrum 377
- T
- tandem accelerator 358
 - Taylor cone 237, 273
 - telecentric mode 160
 - television camera tube 143
 - television tube 439
 - temperature limited emission 10
 - tera-hertz (THz) 315
 - applications 319
 - photon 317
 - radiation 320
 - generation 320
 - spectroscopy 321
 - TESLA Test Facility (TTF) 369
 - thermal annealing 246

- thermal barrier coatings (TBC) 181
 thermal conductivity, *see also* thermal diffusivity 172, 173, 395, 396, 412
 gauge, *see also* Pirani gauge 498
 thermal diffusivity 173
 thermal EB machining processes 171
 thermal electron emission 431
 thermal field emission cathode 192
 thermal processing of solids 171
 thermal processing of thin films 171
 thermal surface treatment 155
 thermally grown oxide (TGO) 181
 thermionic cathode 26, 71, 155, 431, 441, 460
 thermionic constant 432
 thermionic electron source 447
 thermionic emission 431
 thermistor gauge 499
 thermo-field emission cathode 453
 thermo-field (T-F)/emission, *see also* Schottky emission 453
 thermocouple 499
 gauge 499
 thermography 318
 thin film 492
 thin tungsten filament 118
 thin-film evaporation 490
 Thomson effect 435
 thoriated tungsten cathode 437
 thoriated tungsten (Th-W) wire cathode 436
 three-band colour radiator 331
 three-dimensional analysis 236
 thrust 267, 271, 273, 278
 level 266, 268, 271, 288, 294
 thruster with anode layer (TAL) 279
 time-of-flight mass spectrometer 506
 titanium sublimation pump (TSP) 390, 391
 TOF-SIMS 236
 top-layer (T-L) Scandate cathode 441
 total efficiency 37, 42-44, 46
 total gain 53
 transfer curves 6
 transfer of beam energy 4
 transformer tap changers 424
 transient recovery voltage (TRV) 414
 transit angle 65
 transparent photocathode 139
 transverse emittance 370
 transverse gun 181
 traveling wave tube (TWT) 3, 24, 29, 45, 47, 49, 289, 493
 applications 45
 collector 28
 communication 45
 coupled cavity 3
 efficiency 29, 44
 helix 3
 total efficiency 43
 Triglycinsulfate (TGS) 148
 triode 2, 22, 118, 145
 compact 82
 pump 494
 tungsten (W) wire cathode 436
 turbo-molecular pump system 408
 turbomolecular pump, *see also* turbopump 390, 494, 495
 TV klystron 22
 TV tube 490
 two aperture method 171
 two-stage rotary vane vacuum pump 489
 twystron 74
- U
- UBITRON 62
 UHP lamp 331
 UHV diode 475
 UHV pump 492
 ultra-fast photomultiplier 137, 138
 ultrahigh vacuum (UHV) 485, 490, 494, 503, 507, 518
 ultraviolet (UV) light 334
 UVA 334
 UVB 334
 UVC 334
 undoped cathode 443
 undulator 64
 magnet 368
 universal beam spread 31
 UV arc lamp 336
 UV lithography 242
 UV photon 326
- V
- vacuum based display (VFD) 85, 92, 118
 waveform 121
 vacuum chamber 473
 vacuum circuit breakers 407, 409

- vacuum conductance 389
 - vacuum fluorescent display (VFD) 85, 87, 118
 - vacuum interrupter 407, 415, 421, 426, 493
 - design 417
 - vacuum microelectronic 82, 278
 - vacuum pressure 485, 497, 504, 519
 - vacuum pump 473, 483, 487, 517
 - vacuum tube 132, 143, 449
 - vacuum ultraviolet (VUV) 334
 - van de Graaff generator 358
 - vapour diffusion pump 490
 - vapour pressure 477, 491
 - variable shaped beam (VSB) 193
 - vector potential 7, 9
 - vectorial photoeffect 468
 - video bandwidth 91
 - videosignal 149
 - production 146
 - Vidicon 143
 - target 144
 - viscosity 476
 - visible photon 326
 - Vivitron 358
 - vulcanization of elastomers 202
- W
- W-I cathode 443
 - wafer 242, 244
 - contamination 252
 - handling system 248
 - heating 251
 - wall plug efficiency 312
 - wavelength dispersive spectrometry (WDS) 218
 - weak focusing principle 360
 - Wehnelt electrode 30
 - welding 155, 173
 - depth 174
 - process 156, 173
 - speed 174
 - system 166, 174
 - Wideröe condition 364
 - wiggler 64, 70, 78
 - magnet 368
 - Wolter telescopes 348
 - work function (Austrittsarbeit) 10, 101, 128, 259, 432, 433, 437, 455, 477
- X
- X-ray 343
 - diffractometer 346
 - dosimetry 345
 - FEL 317
 - filter 344
 - image amplifier 140
 - imaging 347, 349
 - lines 344
 - spectroscopy 209
 - tube 430, 451, 493, 517
 - Xe propellant gas 291
 - XHV pump 492
- Z
- Zeiss Crossbeam 243, 244
 - zero field thermionic emission 432