

Subject index

Volume 48, 2005

[This subject index is based on the Physics and Astronomy Classification Scheme (PACS 2003)]

00. GENERAL

01. Communication, education, history, and philosophy

01.10. – m Announcements, news, and organizational activities

01.10.Fv Conferences, lectures, and institutes 77, 83, 91, 173, 177, 183, 187, 191, 198, 295, 306, 312, 519, 525, 533, 601, 615, 626, 635, 638, 743, 747, 847, 855, 859, 953, 958, 962, 1055, 1057, 1061, 1071

01.30. – y Physics literature and publications

01.30.Tt Bibliographies 102, 209, 319, 539, 755, 975, 1087, 1291, 1293

01.40. – d Education 515, 971

01.55. + b General physics 95

01.60. + q Biographies, tributes, personal notes, and obituaries 97, 99, 205, 207, 649, 755, 969, 1055, 1085, 1197, 1199

01.65. + g History of science 173, 515, 755, 847, 1039, 1055, 1177, 1187, 1251, 1265

01.70. + w Philosophy of science 389, 595

01.90. + g Other topics of general interest 101, 204, 254, 429, 543, 594, 759, 865, 977, 1091, 1203, 1289

02. Mathematical methods in physics

02.30. – f Function theory, analysis

02.30.Yy Control theory 103

02.40. – k Geometry, differential geometry, and topology 675, 1205

02.50. – r Probability theory, stochastic processes, and statistics 151

02.70. – c Computational techniques

02.70.Uu Applications of Monte Carlo methods 887

03. Quantum mechanics, field theories, and special relativity

03.30. + p Special relativity 95, 167, 971

03.65. – w Quantum mechanics 389, 515, 999

03.65.Ca Formalism 841

03.65.Ge Solutions of wave equations: bound states 797, 841, 962

03.65.Nk Scattering theory 962

03.65.Sq Semiclassical theories and applications 797

03.65.Ta Foundations of quantum mechanics; measurement theory 389, 595, 999, 1039

03.65.Yz Decoherence; open systems; quantum statistical methods 1

03.67. – a Quantum information 1, 389, 999

03.67.Lx Quantum computation 1

03.75. – b Matter waves

03.75.Nt Other Bose–Einstein condensation phenomena 295

04. General relativity and gravitation

04.30. – w Gravitational waves: theory 1235

04.50. + h Gravity in more than four dimensions, Kaluza–Klein theory, unified field theories; alternative theories of gravity 545

04.60. – m Quantum gravity 1039

04.62. + v Quantum field theory in curved spacetime 577, 1235

04.70. – s Physics of black holes 577

04.80. – y Experimental studies of gravity

04.80.Nn Gravitational wave detectors and experiments 595

05. Statistical physics, thermodynamics, and nonlinear dynamical systems

05.30. – d Quantum statistical mechanics 281

05.45. – a Nonlinear dynamics and nonlinear dynamical systems 151

05.45.Gg Control of chaos, applications of chaos 103

05.45.Xt Synchronization; coupled oscillators 103

06. Metrology, measurements, and laboratory procedures

06.20. – f Metrology 255, 867, 939

06.20.Fn Units and standards 255

06.20.Jr Determination of fundamental constants 255

06.30. – k Measurements common to several branches of physics and astronomy 255

07. Instruments, apparatus, and components common to several branches of physics and astronomy

07.07. – a General equipment

07.07.Df Sensors 231, 855, 859

07.50. – e Electrical and electronic instruments and components 917

07.57. – c Infrared, submillimeter wave, microwave and radio-wave instruments and equipment 519, 1151

07.57.Kp Bolometers; infrared, submillimeter wave, microwave, and radiowave receivers and detectors 519

10. THE PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

11. General theory of fields and particles

11.15. – q Gauge field theories 1093

11.25. – w Strings and branes 545, 1093

11.25.Tq Gauge/string duality 1093

- 11.27.+d **Extended classical solutions; cosmic strings, domain walls, texture** 577
- 11.30.–j **Symmetry and conservation laws** 825
- 11.30.Er Charge conjugation, parity, time reversal, and other discrete symmetries 825, 939
- 11.30.Pb Supersymmetry 1093
- 12. Specific theories and interaction models; particle systematics**
- 12.20.–m **Quantum electrodynamics** 1177
- 12.38.–t **Quantum chromodynamics** 323
- 12.38.Mh Quark-gluon plasma 323
- 13. Specific reactions and phenomenology**
- 13.85.–t **Hadron-induced high- and super-high-energy interactions (energy > 10 GeV)** 323
- 14. Properties of specific particles**
- 14.20.–c **Baryons (including antiparticles)**
- 14.20.Dh Protons and neutrons 867
- 14.60.–z **Leptons**
- 14.60.Pq Neutrino mass and mixing 825
- 14.60.St Non-standard-model neutrinos, right-handed neutrinos, etc. 825
- 14.70.–e **Gauge bosons**
- 14.70.Bh Photons 1177
- 20. NUCLEAR PHYSICS**
- 21. Nuclear structure**
- 21.10.–k **Properties of nuclei; nuclear energy levels**
- 21.10.Re Collective levels 525
- 23. Radioactive decay and in-beam spectroscopy**
- 23.20.–g **Electromagnetic transitions**
- 23.20.Lv Gamma transitions and level energies 525
- 23.20.Nx Internal conversion and extranuclear effects 525
- 25. Nuclear reactions: specific reactions**
- 25.20.–x **Photonuclear reactions**
- 25.20.Dc Photon absorption and scattering 525
- 25.60.–t **Reactions induced by unstable nuclei**
- 25.60.Pj Fusion reactions 281
- 25.75.–q **Relativistic heavy-ion collisions**
- 25.75.Nq Quark deconfinement, quark-gluon plasma production, and phase transitions 323
- 27. Properties of specific nuclei listed by mass ranges**
- 27.70.+q **150 (less-than-or-equal-to) A (less-than-or-equal-to) 189** 525
- 28. Nuclear engineering and nuclear power studies**
- 28.20.–v **Neutron physics** 867
- 28.52.–s **Fusion reactors** 1129
- 28.70.+y **Nuclear explosions** 1187, 1251
- 30. ATOMIC AND MOLECULAR PHYSICS**
- 32. Atomic properties and interactions with photons**
- 32.10.–f **Properties of atoms**
- 32.10.Dk Electric and magnetic moments, polarizability 939
- 32.60.+i **Zeeman and Stark effects** 939
- 32.80.–t **Photon interactions with atoms**
- 32.80.Qk Coherent control of atomic interactions with photons 103
- 33. Molecular properties and interactions with photons**
- 33.50.–j **Fluorescence and phosphorescence; radiationless transitions, quenching** 231
- 33.80.–b **Photon interactions with molecules** 37
- 36. Exotic atoms and molecules; macromolecules; clusters**
- 36.40.–c **Atomic and molecular clusters**
- 36.40.Ei Phase transitions in clusters 345
- 40. ELECTROMAGNETISM, OPTICS, ACOUSTICS, HEAT TRANSFER, CLASSICAL MECHANICS, AND FLUID DYNAMICS**
- 41. Electromagnetism; electron and ion optics**
- 41.20.–q **Applied classical electromagnetism** 167, 903
- 41.20.Cv Electrostatics; Poisson and Laplace equations, boundary-value problems 939
- 41.60.–m **Radiation by moving charges**
- 41.60.Bq Cherenkov radiation 903
- 41.60.Cr Free-electron lasers 1249
- 41.75.–i **Charged-particle beams** 903, 917
- 41.75.Fr Electron and positron beams 1015
- 42. Optics**
- 42.15.–i **Geometrical optics** 609
- 42.25.–p **Wave optics** 797
- 42.25.Bs Wave propagation, transmission and absorption 797
- 42.25.Fx Diffraction and scattering 609
- 42.25.Gy Edge and boundary effects; reflection and refraction 797
- 42.50.–p **Quantum optics** 469
- 42.50.Xa Optical tests of quantum theory 595
- 42.55.–f **Lasers** 1249
- 42.55.Vc X- and gamma-ray lasers 1249
- 42.55.Wd Fiber lasers 91
- 42.62.–b **Laser applications**
- 42.62.Fi Laser spectroscopy 37
- 42.65.–k **Nonlinear optics** 306, 312
- 42.70.–a **Optical materials**
- 42.70.Df Liquid crystals 419, 747
- 42.70.Qs Photonic bandgap materials 747
- 42.79.–e **Optical elements, devices, and systems**
- 42.79.Kr Display devices, liquid-crystal devices 419, 747
- 42.81.–i **Fiber optics** 91

- 45. Classical mechanics of discrete systems**
- 45.40.–f Dynamics and kinematics of rigid bodies 1205
45.80.+r Control of mechanical systems 103
- 46. Continuum mechanics of solids**
- 46.05.+b General theory of continuum mechanics of solids 675
- 47. Fluid dynamics**
- 47.27.–i Turbulent flows, convection, and heat transfer 449
47.27.Te Convection and heat transfer 1151
47.32.–y Rotational flow and vorticity 449
47.32.Cc Vortex dynamics 841
47.40.–x Compressible flows; shock and detonation phenomena 733
47.52.+j Chaos 151
- 50. PHYSICS OF GASES, PLASMAS, AND ELECTRIC DISCHARGES**
- 51. Physics of gases**
- 51.50.+v Electrical properties 1015
- 52. Physics of plasmas and electric discharges**
- 52.25.–b Plasma properties 1129
52.55.–s Magnetic confinement and equilibrium 1129
52.59.–f Intense particle beams and radiation sources 211
52.77.–j Plasma applications 487
52.80.–s Electric discharges 211
52.80.Dy Low-field and Townsend discharges 1015
- 60. CONDENSED MATTER: STRUCTURAL, MECHANICAL AND THERMAL PROPERTIES**
- 61. Structure of solids and liquids; crystallography**
- 61.30.–v Liquid crystals 419, 743, 747
61.44.–n Semi-periodic solids 411
61.44.Br Quasicrystals 411
61.46.–w Nanoscale materials 1061
61.48.+c Fullerenes and fullerene-related materials 419
61.50.–f Crystalline state
61.50.Ah Theory of crystal structure, crystal symmetry; calculations and modeling 761
61.66.–f Structure of specific crystalline solids 761
61.66.Fn Inorganic compounds 651
61.72.–y Defects and impurities in crystals; microstructure
61.72.Ji Point defects 345, 651
61.72.Lk Linear defects: dislocations, disclinations 675
- 62. Mechanical and acoustical properties of condensed matter**
- 62.20.–x Mechanical properties of solids
62.20.Dc Elasticity, elastic constants 411
62.30.+d Mechanical and elastic waves; vibrations 411
- 62.50.+p High-pressure and shock wave effects in solids and liquids 733, 761
- 63. Lattice dynamics**
- 63.20.–e Phonons in crystal lattices
63.20.Mt Phonon-defect interactions 675
- 64. Equations of state, phase equilibria, and phase transitions**
- 64.70.–p Specific phase transitions
64.70.Dv Solid-liquid transitions 345
64.70.Kb Solid-solid transitions 713
64.70.Md Transitions in liquid crystals 743
64.70.Pf Glass transitions 345
- 67. Quantum fluids and solids; liquid and solid helium**
- 67.40.–w Boson degeneracy and superfluidity of ^4He 173
67.40.Yv Impurities and other defects 1061
67.57.–z Superfluid phase of liquid ^3He 77
67.57.Lm Spin dynamics 77
- 68. Surfaces and interfaces; thin films and low-dimensional systems**
- 68.03.–g Gas-liquid and vacuum-liquid interfaces 1151
68.35.–p Solid surfaces and solid-solid interfaces: structure and energetics 1057
68.37.–d Microscopy of surfaces, interfaces, and thin films 1057
68.37.Ef Scanning tunneling microscopy 1057
68.43.–h Chemisorption/physisorption: adsorbates on surfaces 1161
- 70. CONDENSED MATTER: ELECTRONIC STRUCTURE, ELECTRICAL, MAGNETIC, AND OPTICAL PROPERTIES**
- 71. Electronic structure of bulk materials**
- 71.10.–w Theories and models of many-electron systems 1071
71.10.Hf Non-Fermi-liquid ground states, electron phase diagrams and phase transitions in model systems 1071
71.15.–m Methods of electronic structure calculations
71.15.Mb Density functional theory, local density approximation, gradient and other corrections 761
71.27.+a Strongly correlated electron systems; heavy fermions 1071
71.30.+h Metal-insulator transitions and other electronic transitions 129, 1071
71.35.–y Excitons and related phenomena 887
71.35.Lk Collective effects (Bose effects, phase space filling, and excitonic phase transitions) 295
71.36.+c Polaritons 306, 312
71.38.–k Polarons and electron-phonon interactions 887
71.70.–d Level splitting and interactions
71.70.Ej Spin-orbit coupling, Zeeman and Stark splitting, Jahn–Teller effect 231

- 72. Electronic transport in condensed matter**
- 72.15. –v Electronic conduction in metals and alloys**
72.15.Gd Galvanomagnetic and other magnetotransport effects 958
72.15.Rn Localization effects (Anderson or weak localization) 958
- 72.20. –i Conductivity phenomena in semiconductors and insulators** 183, 187, 191, 198
72.20.My Galvanomagnetic and other magnetotransport effects 183, 187, 191
- 72.25. –b Spin polarized transport**
72.25.Pn Current-driven spin pumping 603
- 72.40. + w Photoconduction and photovoltaic effects** 183, 187, 191
- 72.50. + b Acoustoelectric effects** 847, 855, 859
- 73. Electronic structure and electrical properties of surfaces, interfaces, thin films, and low-dimensional structures**
- 73.20. –r Electron states at surfaces and interfaces** 953
73.20.Mf Collective excitations (including excitons, polarons, plasmons and other charge-density excitations) 295
- 73.25. + i Surface conductivity and carrier phenomena** 953
- 73.40. –c Electronic transport in interface structures** 198
73.40.Qv Metal-insulator-semiconductor structures 129
- 73.43. –f Quantum Hall effects** 129
73.43.Qt Magnetoresistance 198
- 73.50. –h Electronic transport phenomena in thin films** 953
73.50.Rb Acoustoelectric and magnetoacoustic effects 847
- 73.61. –r Electrical properties of specific thin films** 953
- 73.63. –b Electronic transport in nanoscale materials and structures** 958, 962
73.63.Bd Nanocrystalline materials 958
73.63.Fg Nanotubes 958
- 74. Superconductivity**
- 74.20. –z Theories and models of superconducting state** 173, 177
74.20.De Phenomenological theories 979
- 74.25. –q Properties of type I and type II superconductors**
74.25.Dw Superconductivity phase diagrams 979
74.25.Fy Transport properties 979
74.25.Nf Response to electromagnetic fields 979
- 74.72. –h Cuprate superconductors (high- T_c and insulating parent compounds)** 173, 177, 887, 979
- 75. Magnetic properties and materials**
- 75.10. –b General theory and models of magnetic ordering** 83, 431
- 75.30. –m Intrinsic properties of magnetically ordered materials** 83
75.30.Ds Spin waves 431
- 75.50. –y Studies of specific magnetic materials** 431
75.50.Dd Nonmetallic ferromagnetic materials 651
75.50.Ee Antiferromagnetics 83
- 75.80. + q Magnetomechanical and magnetoelectric effects, magnetostriction** 431
- 76. Magnetic resonances and relaxations in condensed matter, Mössbauer effect**
- 76.30. –v Electron paramagnetic resonance and relaxation** 1061
- 76.60. –k Nuclear magnetic resonance and relaxation** 781
- 77. Dielectrics, piezoelectrics, and ferroelectrics and their properties**
- 77.65. –j Piezoelectricity and electromechanical effects**
77.65.Dq Acoustoelectric effects and surface acoustic waves (SAW) in piezoelectrics 855, 859
- 78. Optical properties, condensed-matter spectroscopy and other interactions of radiation and particles with condensed matter**
- 78.67. –n Optical properties of low-dimensional, mesoscopic, and nanoscale materials and structures** 306, 312, 603
- 80. INTERDISCIPLINARY PHYSICS AND RELATED AREAS OF SCIENCE AND TECHNOLOGY**
- 81. Materials science**
- 81.15. –z Methods of deposition of films and coatings; film growth and epitaxy** 487
- 81.30. –t Phase diagrams and microstructures developed by solidification and solid-solid phase transformations** 713
81.30.Kf Martensitic transformations 713
- 81.65. –b Surface treatments** 487
- 82. Physical chemistry and chemical physics**
- 82.20. –w Chemical kinetics and dynamics** 281
82.20.Db Transition state theory and statistical theories of rate constants 281
82.20.Wt Computational modeling; simulation 733
- 82.33. –z Reactions in various media**
82.33.Tb Atmospheric chemistry 1265
- 82.40. –g Chemical kinetics and reactions: special regimes and techniques**
82.40.Fp Shock wave initiated reactions, high-pressure chemistry 37
- 82.45. –h Electrochemistry and electrophoresis**
82.45.Bb Corrosion and passivation 487
- 82.50. –m Photochemistry**
82.50.Bc Processes caused by infrared radiation 37
- 82.56. –b Nuclear magnetic resonance** 781, 1161
82.56.Pp NMR of biomolecules 781
- 84. Electronics; radiowave and microwave technology; direct energy conversion and storage**
- 84.30. –r Electronic circuits**
84.30.Jc Power electronics; power supply circuits 211
- 84.40. –x Radiowave and microwave (including millimeter wave) technology** 211, 917
84.40.Fe Microwave tubes 917

- 84.47. + w Vacuum tubes 469
- 84.70. + p High-current and high-voltage technology: power systems; power transmission lines and cables 211, 703
85. Electronic and magnetic devices; microelectronics
- 85.30. – z Semiconductor devices 703
- 85.30.Kk Junction diodes 703
- 85.60. – q Optoelectronic devices
- 85.60.Gz Photodetectors 469
- 85.75. – d Magnetoelectronics; spintronics: devices exploiting spin polarized transport or integrated magnetic fields 603
87. Biological and medical physics
- 87.50. – a Effects of radiation and external fields on biomolecules, cells, and higher organisms 537
90. GEOPHYSICS, ASTRONOMY, AND ASTROPHYSICS
91. Solid Earth physics
- 91.60. – x Physical properties of rocks and minerals 1161
92. Hydrospheric and atmospheric geophysics
- 92.10. – c Physics of the oceans 1205
- 92.60. – e Meteorology 1205
94. Aeronomy and magnetospheric physics
- 94.10. – s Physics of the neutral atmosphere
- 94.10.Fa Atmospheric composition (atomic or molecular), chemical reactions and processes 1265
95. Fundamental astronomy and astrophysics; instrumentation, techniques, and astronomical observations
- 95.30. – k Fundamental aspects of astrophysics 533
- 95.55. – n Astronomical and space-research instrumentation
- 95.55.Rg Photoconductors and bolometers 519
- 95.80. + p Astronomical catalogs, atlases, sky surveys, databases, retrieval systems, archives, etc. 1109
96. Solar System
- 96.30. – t Planets, their satellites and rings; asteroids 615, 626, 635
- 96.30.Ys Asteroids (minor planets) 638
- 96.35. – j Planetary, asteroid, cometary, and satellite characteristics and properties 635, 733
- 96.35.Cp Origin, formation, evolution, and ages 626, 638
- 96.35.Hv Neutral atmospheres 626, 635
- 96.35.Kx Ionospheres; magnetospheres 615
- 96.50. – e Interplanetary space
- 96.50.Ek Solar wind interactions with planets, satellites, and comets 615
- 96.50.Gn Comets 638, 733
97. Stars
- 97.10. – q Stellar characteristics and properties 449
98. Stellar systems; interstellar medium; galactic and extragalactic objects and systems; the Universe
- 98.62. – g Characteristics and properties of external galaxies and extragalactic objects 1109
- 98.65. – r Galaxy groups, clusters, and superclusters; large scale structure of the Universe 1109
- 98.80. – k Cosmology 533, 1235
- 98.80.Cq Particle-theory and field-theory models of the early Universe 545