PACS 2010 Special Edition—Sec. 00

00.   **GENERAL**

01.   **Communication, education, history, and philosophy**

01.10.-m   **Announcements, news, and organizational activities**

01.10.Cr   Announcements, news, and awards

01.10.Fv   Conferences, lectures, and institutes

01.10.Hx   Physics organizational activities

01.20.+x   **Communication forms and techniques (written, oral, electronic, etc.)**

01.30.-y   **Physics literature and publications**

01.30.Bb   Publications of lectures (advanced institutes, summer schools, etc.)

01.30.Cc   Conference proceedings

01.30.Ee   Monographs and collections

01.30.Kj   Handbooks, dictionaries, tables, and data compilations

01.30.L-   Physics laboratory manuals

01.30.la   *Secondary schools*

01.30.lb   *Undergraduate schools*

01.30.M-   Textbooks

01.30.mm *Textbooks for graduates and researchers*

01.30.mp   *Textbooks for undergraduates*

01.30.mr   *Textbooks for students in grades 9-12*

01.30.mt   *Textbooks for students in grades K-8*

01.30.Os   Books of general interest to physics teachers

01.30.Rr   Surveys and tutorial papers; resource letters

01.30.Tt   Bibliographies

01.30.Vv   Book reviews

N 01.30.Ww Editorials

01.30.Xx   Publications in electronic media *(for the topic of electronic publishing, see 01.20.+x)*

01.40.-d   Education

01.40.Di   Course design and evaluation

01.40.E-   Science in school

01.40.eg   Elementary school

01.40.ek   Secondary school

01.40.Fk   Research in physics education

01.40.G-   Curricula and evaluation

01.40.gb   Teaching methods and strategies

01.40.gf   Theory of testing and techniques

01.40.Ha   Learning theory and science teaching

01.40.J-   Teacher training

01.40.jc   Preservice training

01.40.jh   Inservice training

01.50.-i   Educational aids

01.50.F-   Audio and visual aids

01.50.fd   Audio devices

01.50.ff   Films; electronic video devices

01.50.fh   Posters, cartoons, art, etc.

01.50.H-   Computers in education

01.50.ht   Instructional computer use

01.50.hv   Computer software and software reviews

01.50.Kw   Techniques of testing

01.50.Lc   Laboratory computer use *(see also 01.50.Pa)*

01.50.My   Demonstration experiments and apparatus

01.50.Pa   Laboratory experiments and apparatus *(see also 01.50.Lc)*

01.50.Qb   Laboratory course design, organization, and evaluation

01.50.Rt   Physics tournaments and contests

01.50.Wg   Physics of toys

01.50.Zv   Errors in physics classroom materials

01.52.+r   National and international laboratory facilities

01.55.+b   General physics

01.60.+q   Biographies, tributes, personal notes, and obituaries

01.65.+g   History of science

01.70.+w   **Philosophy of science**

S **01.75.+m** **Science and society** *(for science and government, see 01.78.+p)*

M **01.75.+m** **Science and society** *(for science and government, see 01.78.+p; for social issues regarding wind energy, see 88.50.Xy; for social issues regarding biomass energy, see 88.20.Y-)*

S **01.78.+p** **Science and government (funding, politics, etc.)**

M **01.78.+p** **Science and government (funding, politics, etc.)** *(see also 88.05.Jk Policy issues; resource assessment)*

01.80.+b   **Physics of games and sports**

01.85.+f   **Careers in physics and science**

01.90.+g   **Other topics of general interest (restricted to new topics in section 01)**

02.   **Mathematical methods in physics**

02.10.-v   **Logic, set theory, and algebra**

02.10.Ab   Logic and set theory

02.10.De   Algebraic structures and number theory

02.10.Hh   Rings and algebras

02.10.Kn   Knot theory

02.10.Ox   Combinatorics; graph theory

02.10.Ud   Linear algebra

02.10.Xm   Multilinear algebra

02.10.Yn   Matrix theory

02.20.-a   Group theory *(for algebraic methods in quantum mechanics, see 03.65.Fd; for symmetries in elementary particle physics, see 11.30.-j)*

02.20.Bb   General structures of groups

02.20.Hj   Classical groups

02.20.Qs   General properties, structure, and representation of Lie groups

02.20.Rt   Discrete subgroups of Lie groups

02.20.Sv   Lie algebras of Lie groups

02.20.Tw   Infinite-dimensional Lie groups

02.20.Uw   Quantum groups

02.30.-f   Function theory, analysis

02.30.Cj   Measure and integration

02.30.Em   Potential theory

02.30.Fn   Several complex variables and analytic spaces

02.30.Gp   Special functions

02.30.Hq   Ordinary differential equations

02.30.Ik   Integrable systems

02.30.Jr   Partial differential equations

02.30.Ks   Delay and functional equations

02.30.Lt   Sequences, series, and summability

02.30.Mv   Approximations and expansions

02.30.Nw   Fourier analysis

02.30.Oz   Bifurcation theory *(see also 47.20.Ky in fluid dynamics)*

02.30.Px   Abstract harmonic analysis

02.30.Rz   Integral equations

02.30.Sa   Functional analysis

02.30.Tb   Operator theory

02.30.Uu   Integral transforms

02.30.Vv   Operational calculus

02.30.Xx   Calculus of variations

02.30.Yy   Control theory

02.30.Zz   Inverse problems

02.40.-k   Geometry, differential geometry, and topology *(see also section 04 Relativity and gravitation)*

02.40.Dr   Euclidean and projective geometries

02.40.Ft   Convex sets and geometric inequalities

02.40.Gh   Noncommutative geometry

02.40.Hw   Classical differential geometry

02.40.Ky   Riemannian geometries

02.40.Ma   Global differential geometry

02.40.Pc   General topology

02.40.Re   Algebraic topology

02.40.Sf   Manifolds and cell complexes

02.40.Tt   Complex manifolds

02.40.Vh   Global analysis and analysis on manifolds

02.40.Xx   Singularity theory *(see also 05.45.-a Nonlinear dynamics and chaos)*

02.40.Yy   Geometric mechanics *(see also 45.20.Jj in formalisms in classical mechanics)*

02.50.-r   **Probability theory, stochastic processes, and statistics** *(see also section 05 Statistical physics, thermodynamics, and nonlinear dynamical systems)*

02.50.Cw   Probability theory

02.50.Ey   Stochastic processes

02.50.Fz   Stochastic analysis

02.50.Ga   Markov processes

02.50.Le   Decision theory and game theory

02.50.Ng   Distribution theory and Monte Carlo studies

02.50.Sk   Multivariate analysis

02.50.Tt   Inference methods

02.60.-x   **Numerical approximation and analysis**

02.60.Cb   Numerical simulation; solution of equations

02.60.Dc   Numerical linear algebra

02.60.Ed   Interpolation; curve fitting

02.60.Gf   Algorithms for functional approximation

02.60.Jh   Numerical differentiation and integration

02.60.Lj   Ordinary and partial differential equations; boundary value problems

02.60.Nm   Integral and integrodifferential equations

02.60.Pn   Numerical optimization

02.70.-c   Computational techniques; simulations *(for quantum computation, see 03.67.Lx; for computational techniques extensively used in subdivisions of physics, see the appropriate section; for example, see 47.11.-j Computational methods in fluid dynamics)*

02.70.Bf   Finite-difference methods

02.70.Dh   Finite-element and Galerkin methods

02.70.Hm   Spectral methods

02.70.Jn   Collocation methods

02.70.Ns   Molecular dynamics and particle methods

02.70.Pt   Boundary-integral methods

02.70.Rr   General statistical methods

02.70.Ss   Quantum Monte Carlo methods

02.70.Tt   Justifications or modifications of Monte Carlo methods

02.70.Uu Applications of Monte Carlo methods *(see also 02.50.Ng in probability theory, stochastic processes, and statistics, and 05.10.Ln in statistical physics)*

02.70.Wz Symbolic computation (computer algebra)

02.90.+p Other topics in mathematical methods in physics (restricted to new topics in section 02)

03. Quantum mechanics, field theories, and special relativity *(see also section 11 General theory of fields and particles)*

03.30.+p Special relativity

03.50.-z Classical field theories

03.50.De Classical electromagnetism, Maxwell equations *(for applied classical electromagnetism, see 41.20.-q)*

03.50.Kk Other special classical field theories

03.65.-w Quantum mechanics *[see also 03.67.-a Quantum information; 05.30.-d Quantum statistical mechanics; 31.30.J- Relativistic and quantum electrodynamics (QED) effects in atoms, molecules, and ions in atomic physics]*

N 03.65.Aa Quantum systems with finite Hilbert space

03.65.Ca Formalism

03.65.Db Functional analytical methods

03.65.Fd Algebraic methods *(see also 02.20.-a Group theory)*

03.65.Ge   Solutions of wave equations: bound states

03.65.Nk   Scattering theory

03.65.Pm   Relativistic wave equations

03.65.Sq   Semiclassical theories and applications

03.65.Ta   Foundations of quantum mechanics; measurement theory *(for optical tests of quantum theory, see 42.50.Xa)*

03.65.Ud   Entanglement and quantum nonlocality (e.g. EPR paradox, Bell's inequalities, GHZ states, etc.) *(for entanglement production and manipulation, see 03.67.Bg; for entanglement measures, witnesses etc., see 03.67.Mn; for entanglement in Bose-Einstein condensates, see 03.75.Gg)*

03.65.Vf   Phases: geometric; dynamic or topological

03.65.Wj   State reconstruction, quantum tomography

03.65.Xp   Tunneling, traversal time, quantum Zeno dynamics

03.65.Yz   Decoherence; open systems; quantum statistical methods *(see also 03.67.Pp in quantum information; for decoherence in Bose-Einstein condensates, see 03.75.Gg)*

03.67.-a   Quantum information *(see also 42.50.Dv Quantum state engineering and measurements; 42.50.Ex Optical implementations of quantum information processing and transfer in quantum optics)*

03.67.Ac   Quantum algorithms, protocols, and simulations

03.67.Bg   Entanglement production and manipulation *(for entanglement in Bose-Einstein condensates, see 03.75.Gg)*

03.67.Dd   Quantum cryptography and communication security

03.67.Hk   Quantum communication

03.67.Lx   Quantum computation architectures and implementations

03.67.Mn   Entanglement measures, witnesses, and other characterizations *(see also 03.65.Ud Entanglement and quantum nonlocality; 42.50.Dv Quantum state engineering and measurements in quantum optics)*

03.67.Pp   Quantum error correction and other methods for protection against decoherence *(see also 03.65.Yz Decoherence; open systems; quantum statistical methods; for decoherence in Bose-Einstein condensates, see 03.75.Gg)*

03.70.+k   Theory of quantized fields *(see also 11.10.-z Field theory)*

03.75.-b   Matter waves *(for atom interferometry, see 37.25.+k; see also 67.85.-d ultracold gases, trapped gases in quantum fluids and solids)*

03.75.Be   Atom and neutron optics

03.75.Dg   Atom and neutron interferometry

03.75.Gg   Entanglement and decoherence in Bose-Einstein condensates

03.75.Hh   Static properties of condensates; thermodynamical, statistical, and structural properties

03.75.Kk   Dynamic properties of condensates; collective and hydrodynamic excitations, superfluid flow

S 03.75.Lm   Tunneling, Josephson effect, Bose–Einstein condensates in periodic potentials,

		solitons, vortices, and topological excitations
M	03.75.Lm	Tunneling, Josephson effect, Bose-Einstein condensates in periodic potentials, solitons, vortices, and topological excitations *(see also 74.50.+r Tunneling phenomena; Josephson effects in superconductivity)*

03.75.Mn   Multicomponent condensates; spinor condensates

03.75.Nt   Other Bose-Einstein condensation phenomena

03.75.Pp   Atom lasers

03.75.Ss   Degenerate Fermi gases

S	**04.**	**General relativity and gravitation** *(for astrophysical aspects, see 95.30.Sf Relativity and gravitation; for relativistic aspects of cosmology, see 98.80.Jk)*
M	**04.**	**General relativity and gravitation** *(for astrophysical aspects, see 95.30.Sf Relativity and gravitation; for relativistic aspects of cosmology, see 98.80.Jk; for special relativity, see 03.30.+p)*

04.20.-q   **Classical general relativity** *(see also 02.40.-k Geometry, differential geometry, and topology)*

04.20.Cv   Fundamental problems and general formalism

04.20.Dw   Singularities and cosmic censorship

04.20.Ex   Initial value problem, existence and uniqueness of solutions

04.20.Fy   Canonical formalism, Lagrangians, and variational principles

04.20.Gz   Spacetime topology, causal structure, spinor structure

04.20.Ha   Asymptotic structure

04.20.Jb   Exact solutions

04.25.-g   Approximation methods; equations of motion

04.25.D-   Numerical relativity

04.25.dc   Numerical studies of critical behavior, singularities, and cosmic censorship

04.25.dg   Numerical studies of black holes and black-hole binaries

04.25.dk   Numerical studies of other relativistic binaries (see also 97.80.-d Binary and multiple stars in astronomy)

04.25.Nx   Post-Newtonian approximation; perturbation theory; related approximations

04.30.-w   Gravitational waves *(see also 04.80.Nn Gravitational wave detectors and experiments)*

04.30.Db   Wave generation and sources

04.30.Nk   Wave propagation and interactions

04.30.Tv   Gravitational-wave astrophysics *(see also 95.85.Sz Gravitational radiation, magnetic fields, and other observations in astronomy)*

04.40.-b   Self-gravitating systems; continuous media and classical fields in curved spacetime

04.40.Dg   Relativistic stars: structure, stability, and oscillations *(see also 97.60.-s Late stages of stellar evolution)*

04.40.Nr   Einstein-Maxwell spacetimes, spacetimes with fluids, radiation or classical fields

04.50.-h   **Higher-dimensional gravity and other theories of gravity** *(see also 11.25.Mj Compactification and four-dimensional models, 11.25.Uv D branes)*

04.50.Cd   Kaluza-Klein theories

04.50.Gh   Higher-dimensional black holes, black strings, and related objects

04.50.Kd   Modified theories of gravity

S **04.60.-m**   **Quantum gravity** *(see also 11.25.−w Strings and branes)*

M **04.60.-m**   **Quantum gravity** *(see also 11.25.-w Strings and branes; 11.15.Wx Topologically massive gauge theories, and 11.15.Yc Chern-Simons gauge theory)*

04.60.Bc   Phenomenology of quantum gravity

04.60.Cf   Gravitational aspects of string theory

04.60.Ds   Canonical quantization

04.60.Gw   Covariant and sum-over-histories quantization

04.60.Kz   Lower dimensional models; minisuperspace models

04.60.Nc   Lattice and discrete methods

04.60.Pp   Loop quantum gravity, quantum geometry, spin foams

N 04.60.Rt   Topologically massive gravity *(see also 11.15.Wx Topologically massive gauge theories,*

and 11.15.Yc Chern-Simons gauge theory)

04.62.+v   Quantum fields in curved spacetime

S 04.65.+e   Supergravity *(see also 12.60.Jv Supersymmetric models)*
M 04.65.+e   Supergravity *(see also 12.60.Jv Supersymmetric models; 11.15.Wx Topologically massive gauge theories, and 11.15.Yc Chern-Simons gauge theory)*

04.70.-s   Physics of black holes *(see also 97.60.Lf—in astronomy)*

04.70.Bw   Classical black holes

04.70.Dy   Quantum aspects of black holes, evaporation, thermodynamics

04.80.-y   Experimental studies of gravity

04.80.Cc   Experimental tests of gravitational theories

04.80.Nn   Gravitational wave detectors and experiments *(see also 95.55.Ym Gravitational radiation detectors; mass spectrometers; and other instrumentation and techniques)*

04.90.+e   Other topics in general relativity and gravitation (restricted to new topics in section 04)

05.   Statistical physics, thermodynamics, and nonlinear dynamical systems *(see also 02.50.-r Probability theory, stochastic processes, and statistics)*

05.10.-a   Computational methods in statistical physics and nonlinear dynamics *(see also 02.70.-c in mathematical methods in physics)*

05.10.Cc   Renormalization group methods

05.10.Gg   Stochastic analysis methods (Fokker-Planck, Langevin, etc.)

05.10.Ln   Monte Carlo methods *(see also 02.70.Tt, Uu in mathematical methods in physics; for Monte Carlo methods extensively used in subdivisions of physics, see the appropriate section; for example, see 52.65.Pp in plasma simulation)*

05.20.-y   **Classical statistical mechanics**

05.20.Dd   Kinetic theory *(see also 51.10.+y Kinetic and transport theory of gases)*

05.20.Gg   Classical ensemble theory

05.20.Jj   Statistical mechanics of classical fluids *(see also 47.10.-g General theory in fluid dynamics)*

05.30.-d   **Quantum statistical mechanics** *(for quantum fluids aspects, see 67.10.Fj)*

05.30.Ch   Quantum ensemble theory

05.30.Fk   Fermion systems and electron gas *(see also 71.10.-w Theories and models of many-electron systems; see also 67.10.Db Fermion degeneracy in quantum fluids)*

05.30.Jp   Boson systems *(for static and dynamic properties of Bose-Einstein condensates, see 03.75.Hh and 03.75.Kk; see also 67.10.Ba Boson degeneracy in quantum fluids)*

05.30.Pr   Fractional statistics systems (anyons, etc.)

N 05.30.Rt   Quantum phase transitions *(see also 64.70.Tg Quantum phase transitions in specific phase transitions; and 73.43.Nq Quantum phase transitions in Quantum Hall effects)*

S **05.40.-a**   **Fluctuation phenomena, random processes, noise, and Brownian motion** *(for fluctuations in superconductivity, see 74.40.+k; for statistical theory and fluctuations in nuclear reactions, see 24.60.−k; for fluctuations in plasma, see 52.25.Gj)*

M 05.40.-a   **Fluctuation phenomena, random processes, noise, and Brownian motion** *(for fluctuations in superconductivity, see 74.40.-n; for statistical theory and fluctuations in nuclear reactions, see 24.60.-k; for fluctuations in plasma, see 52.25.Gj; for nonlinear dynamics and chaos, see 05.45.-a)*

05.40.Ca   Noise

05.40.Fb   Random walks and Levy flights

05.40.Jc   Brownian motion

S 05.45.-a   **Nonlinear dynamics and chaos** *(see also section 45 Classical mechanics of discrete systems; for chaos in fluid dynamics, see 47.52.+j)*

M 05.45.-a   **Nonlinear dynamics and chaos** *(see also section 45 Classical mechanics of discrete systems; for chaos in fluid dynamics, see 47.52.+j; for chaos in superconductivity, see 74.40.De)*

05.45.Ac   Low-dimensional chaos

05.45.Df   Fractals *(see also 47.53.+n Fractals in fluid dynamics; 61.43.Hv Fractals; macroscopic aggregates in structure of solids)*

05.45.Gg   Control of chaos, applications of chaos

05.45.Jn   High-dimensional chaos

05.45.Mt   Quantum chaos; semiclassical methods

05.45.Pq   Numerical simulations of chaotic systems

05.45.Ra   Coupled map lattices

05.45.Tp   Time series analysis

05.45.Vx   Communication using chaos

05.45.Xt   Synchronization; coupled oscillators

05.45.Yv   Solitons *(see 52.35.Sb for solitons in plasma; for solitons in acoustics, see 43.25.Rq—in Acoustics Appendix; see 42.50.Md, 42.65.Tg, 42.81.Dp for solitons in optics; see also 03.75.Lm in matter waves; for solitons in space plasma physics, see 94.05.Fg; for solitary waves in fluid dynamics, see 47.35.Fg)*

05.50.+q   Lattice theory and statistics (Ising, Potts, etc.) *(see also 64.60.Cn Order-disorder transformations, and 75.10.Hk Classical spin models)*

05.60.-k   Transport processes

05.60.Cd   Classical transport

05.60.Gg   Quantum transport

05.65.+b   Self-organized systems *(see also 45.70.-n in classical mechanics of discrete systems)*

S	**05.70.-a**	**Thermodynamics** *(see also section 64 Equations of state, phase equilibria, and phase transitions, and section 65 Thermal properties of condensed matter; for chemical thermodynamics, see 82.60.−s; for thermodynamics of plasmas, see 52.25.Kn; for thermodynamic properties of quantum fluids, see section 67)*
M	**05.70.-a**	**Thermodynamics** *(see also section 64 Equations of state, phase equilibria, and phase transitions, and section 65 Thermal properties of condensed matter; for chemical thermodynamics, see 82.60.-s; for thermodynamics of plasmas, see 52.25.Kn; for thermodynamic properties of quantum fluids, see 67.25.bd, and 67.30.ef; for thermodynamics of nanoparticles, see 82.60.Qr, and 65.80.-g; for thermodynamic processes in astrophysics, see 95.30.Tg; for thermodynamics in volcanology, see 91.40.Pc)*

S 05.70.Ce   Thermodynamic functions and equations of state *(see also 51.30.+i Thermodynamic properties, equations of state in physics of gases; for equations of state of specific substances, see 64.30.−t; for equations of state of nuclear matter, and of neutron–star matter, see 21.65.Mn and 26.60.Kp respectively; see also 95.30.Tg in astronomy)*

M 05.70.Ce   Thermodynamic functions and equations of state *(see also 51.30.+i Thermodynamic properties, equations of state in physics of gases; for equations of state of specific substances, see 64.30.-t; for equations of state of nuclear matter, and of neutron-star matter, see 21.65.Mn and 26.60.Kp, respectively; see also 95.30.Tg in astronomy; for thermodynamic properties of superconductors, see 74.25.Bt)*

S 05.70.Fh   Phase transitions: general studies *(see also 64.70.Tg Quantum phase transitions)*

M 05.70.Fh   Phase transitions: general studies *(see also 05.30.Rt Quantum phase transitions in quantum statistical mechanics; 64.70.Tg Quantum phase transitions in specific phase transitions; 73.43.Nq Quantum phase transitions in quantum Hall effects; for superconductivity phase diagrams, see 74.25.Dw; for magnetic phase boundaries, see 75.30.Kz; for ferroelectric phase transitions, see 77.80.B-)*

S 05.70.Jk   Critical point phenomena

M 05.70.Jk   Critical point phenomena *(for quantum critical phenomena in superconductivity, see 74.40.Kb)*

05.70.Ln   Nonequilibrium and irreversible thermodynamics *(see also 82.40.Bj Oscillations, chaos, and bifurcations in physical chemistry and chemical physics)*

05.70.Np   Interface and surface thermodynamics *(see also 68.35.Md Surface thermodynamics, surface energies in surfaces and interfaces)*

05.90.+m   Other topics in statistical physics, thermodynamics, and nonlinear dynamical systems (restricted to new topics in section 05)

06.   Metrology, measurements, and laboratory procedures *(for laser applications in metrology, see 42.62.Eh)*

06.20.-f   Metrology

06.20.Dk   Measurement and error theory

06.20.F-   Units and standards

06.20.fa   Units

06.20.fb   Standards and calibration

06.20.Jr   Determination of fundamental constants

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

06.30.Bp   Spatial dimensions (e.g., position, lengths, volume, angles, and displacements)

06.30.Dr   Mass and density

06.30.Ft   Time and frequency

06.30.Gv   Velocity, acceleration, and rotation

06.30.Ka   Basic electromagnetic quantities *(see also 84.37.+q Measurements in electric variables)*

06.60.-c   Laboratory procedures

06.60.Ei   Sample preparation (including design of sample holders)

06.60.Jn   High-speed techniques (microsecond to femtosecond)

06.60.Mr   Testing and inspecting procedures

06.60.Sx   Positioning and alignment; manipulating, remote handling

06.60.Vz   Workshop procedures (welding, machining, lubrication, bearings, etc.)

S 06.60.Wa   Laboratory safety procedures

M 06.60.Wa   Laboratory safety procedures *(for national and international laboratory facilities, see 01.52.+r)*

06.90.+v   Other topics in metrology, measurements, and laboratory procedures (restricted to new topics in section 06)

07.   Instruments, apparatus, and components common to several branches of physics and astronomy *(see also each subdiscipline for specialized instrumentation and techniques)*

S 07.05.-t   Computers in experimental physics

M 07.05.-t   Computers in experimental physics *(for computers in education, see 01.50.H-, and 01.50.Lc; for quantum computation architectures, see 03.67.Lx; for optical computers, see 42.79.Ta; for computational and simulation techniques, see 02.70.-c in mathematical methods)*

07.05.Bx   Computer systems: hardware, operating systems, computer languages, and utilities

07.05.Dz   Control systems

07.05.Fb   Design of experiments

07.05.Hd   Data acquisition: hardware and software

07.05.Kf   Data analysis: algorithms and implementation; data management *(for data analysis in nuclear physics, see 29.85.-c)*

07.05.Mh   Neural networks, fuzzy logic, artificial intelligence

07.05.Pj   Image processing *(see also 42.30.Va in optics; 87.57.-s Medical imaging in biological and medical physics; 95.75.Tv Digitization techniques in astronomy)*

07.05.Rm   Data presentation and visualization: algorithms and implementation

07.05.Tp   Computer modeling and simulation

07.05.Wr   Computer interfaces *(for nuclear physics applications, see 29.50.+v)*

07.07.-a   General equipment

07.07.Df   Sensors (chemical, optical, electrical, movement, gas, etc.); remote sensing

07.07.Hj   Display and recording equipment, oscilloscopes, TV cameras, etc.

07.07.Mp   Transducers

07.07.Tw   Servo and control equipment; robots

07.07.Vx   Hygrometers; hygrometry

07.10.-h   Mechanical instruments and equipment

S   07.10.Cm   Micromechanical devices and systems *(for micro- and nano-electromechanical systems (MEMS/NEMS), see 85.85.+j in electronic and magnetic devices; see also 87.80.Ek Mechanical and micromechanical techniques; 87.85.Ox Biomedical instrumentation and transducers including micro-electro-mechanical systems in biological and medical physics)*

M   07.10.Cm   Micromechanical devices and systems *[for micro- and nano-electromechanical systems (MEMS/NEMS), see 85.85.+j in electronic and magnetic devices; see also 81.07.Oj*

Nanoelectromechanical systems (NEMS) in nanoscale materials and structures; see also 87.80.Ek Mechanical and micromechanical techniques; 87.85.Ox Biomedical instrumentation and transducers including micro-electro-mechanical systems in biological and medical physics]

07.10.Fq   Vibration isolation

07.10.Lw   Balance systems, tensile machines, etc.

07.10.Pz   Instruments for strain, force, and torque

07.20.-n   Thermal instruments and apparatus

07.20.Dt   Thermometers

07.20.Fw   Calorimeters *(for calorimeters as radiation detectors, see 29.40.Vj)*

07.20.Hy   Furnaces; heaters

07.20.Ka   High-temperature instrumentation; pyrometers

07.20.Mc   Cryogenics; refrigerators, low-temperature detectors, and other low-temperature equipment

07.20.Pe   Heat engines; heat pumps; heat pipes

07.30.-t   Vacuum apparatus

07.30.Bx   Degasification, residual gas

07.30.Cy   Vacuum pumps

07.30.Dz   Vacuum gauges

07.30.Hd   Vacuum testing methods; leak detectors

07.30.Kf   Vacuum chambers, auxiliary apparatus, and materials

07.35.+k   High-pressure apparatus; shock tubes; diamond anvil cells

07.50.-e   Electrical and electronic instruments and components

07.50.Ek   Circuits and circuit components *(see also 84.30.-r Electronic circuits and 84.32.-y Passive circuit components)*

07.50.Hp   Electrical noise and shielding equipment

07.50.Ls   Electrometers

07.50.Qx   Signal processing electronics *(see also 84.40.Ua in radiowave and microwave technology; 87.85.Ng Biological signal processing in biomedical engineering)*

07.55.-w   Magnetic instruments and components

07.55.Db   Generation of magnetic fields; magnets *(for superconducting magnets, see 84.71.Ba; for beam focusing magnets, see 41.85.Lc in beam optics)*

07.55.Ge   Magnetometers for magnetic field measurements

07.55.Jg   Magnetometers for susceptibility, magnetic moment, and magnetization measurements

07.55.Nk   Magnetic shielding in instruments

07.57.-c   **Infrared, submillimeter wave, microwave and radiowave instruments and equipment** *(for infrared and radio telescopes, see 95.55.Cs, 95.55.Fw, and 95.55.Jz in astronomy; for biophysical spectroscopic applications, see 87.64.-t)*

07.57.Hm   Infrared, submillimeter wave, microwave, and radiowave sources *(see also 42.72.Ai Infrared sources in optics)*

07.57.Kp   Bolometers; infrared, submillimeter wave, microwave, and radiowave receivers and detectors *(see also 85.60.Gz Photodetectors in electronic and magnetic devices, and 95.55.Rg Photoconductors and bolometers in astronomy)*

07.57.Pt   Submillimeter wave, microwave and radiowave spectrometers; magnetic resonance spectrometers, auxiliary equipment, and techniques

07.57.Ty   Infrared spectrometers, auxiliary equipment, and techniques

S 07.60.-j   **Optical instruments and equipment** *(see also 87.64.M− Optical microscopy in biological and medical physics)*

M 07.60.-j   **Optical instruments and equipment** *(see also 87.64.M- Optical microscopy in biological and medical physics; for optical sources, see 42.72.-g; see also 42.79.-e Optical elements, devices and systems; for optoelectronic devices, see 85.60.-q; for optical telescopes, see 95.55.Cs; for photometric, polarimetric, and spectroscopic equipment in astronomy, see 95.55.Qf)*

07.60.Dq   Photometers, radiometers, and colorimeters

07.60.Fs   Polarimeters and ellipsometers

07.60.Hv   Refractometers and reflectometers

07.60.Ly   Interferometers

07.60.Pb   Conventional optical microscopes *(for near-field scanning optical microscopes, see 07.79.Fc; for x-ray microscopes, see 07.85.Tt)*

07.60.Rd   Visible and ultraviolet spectrometers

07.60.Vg   Fiber-optic instruments *(see also 42.81.-i Fiber optics)*

07.64.+z   Acoustic instruments and equipment *(see also 43.58.+z—in acoustics)*

07.68.+m   Photography, photographic instruments; xerography

07.75.+h   Mass spectrometers *(see also 82.80.Ms, 82.80.Nj, and 82.80.Rt in physical chemistry and chemical physics)*

07.77.-n   Atomic, molecular, and charged-particle sources and detectors

07.77.Gx   Atomic and molecular beam sources and detectors *(see also 37.20.+j Atomic and molecular beam sources and techniques, in atomic and molecular physics)*

07.77.Ka   Charged-particle beam sources and detectors *(see also 29.40.-n Radiation detectors in nuclear physics)*

07.78.+s   Electron, positron, and ion microscopes; electron diffractometers

07.79.-v   Scanning probe microscopes and components *(see also 68.37.-d Microscopy of surfaces, interfaces, and thin films)*

07.79.Cz   Scanning tunneling microscopes

07.79.Fc   Near-field scanning optical microscopes

07.79.Lh   Atomic force microscopes

07.79.Pk   Magnetic force microscopes

07.79.Sp   Friction force microscopes

07.81.+a   **Electron and ion spectrometers** *(see also 29.30.Dn Electron spectroscopy; 29.30.Ep Charged-particle spectroscopy in nuclear physics)*

S **07.85.-m**   **X- and γ-ray instruments** *(for x- and γ-ray telescopes, see 95.55.Ka in astronomy; see also 41.50.+h X-ray beams and x-ray optics)*

M **07.85.-m**   **X- and γ-ray instruments** *(for x- and γ-ray telescopes, see 95.55.Ka in astronomy; for x-ray beams and x-ray optics, see 41.50.+h)*

07.85.Fv   X- and γ-ray sources, mirrors, gratings, and detectors

07.85.Jy   Diffractometers

07.85.Nc   X-ray and γ-ray spectrometers

07.85.Qe   Synchrotron radiation instrumentation

07.85.Tt   X-ray microscopes

S **07.87.+v**   **Spaceborne and space research instruments, apparatus, and components (satellites, space vehicles, etc.)** *(for instrumentation for space plasma physics, ionosphere, and magnetosphere, see 94.80.+g; see also 95.55.−n and 95.40.+s in astronomy)*

M **07.87.+v**   **Spaceborne and space research instruments, apparatus, and components (satellites, space vehicles, etc.)** *(for instrumentation for space plasma physics, ionosphere, and magnetosphere, see 94.80.+g; see also 95.55.-n and 95.40.+s in astronomy; for materials testing in space, see 81.70.Ha)*

07.88.+y   **Instruments for environmental pollution measurements**

07.89.+b **Environmental effects on instruments (e.g., radiation and pollution effects)** *(for environmental effects on optical elements, devices, and systems, see 42.88.+h)*

07.90.+c **Other topics in instruments, apparatus, and components common to several branches of physics and astronomy (restricted to new topics in section 07)**