

I. Physical optics Propagation and scattering; interference; diffraction; coherence; polarization; geometrical optics; optical vortices and phase singularities; statistical optics; optical measurement techniques; turbulent media; atmospheric optics.

II. Optical information and optical image processing Optical signal processing; optical computing; Fourier transform optics; optical storage and retrieval; holography; pattern recognition; image processing and restoration with optical methods; optical sensing; liquid crystal displays; optical interconnections.

III. Guided wave optics Optical fibers; planar waveguides; photonic crystal waveguides; integrated optics; Bragg filters; waveguide and fiber couplers; fiber measurements; optoelectronic devices; optical fiber sensors.

IV. Atomic and molecular physics Atomic and molecular properties and interaction with electromagnetic fields; multi-photon processes; strong field physics; atomic coherence effects; coherent control; cooperative phenomena; mechanical effects of light; cooling and trapping of atoms, molecules and ions; collision processes.

V. Optical properties of condensed and soft matter X-ray and electron diffraction and scattering; liquid crystals; photonic bandgap materials; condensed matter spectroscopy; optical properties of thin films.

VI. Quantum optics Photon statistics and coherence theory; nonclassical states of the electromagnetic field, including entangled photon states; quantum state engineering and reconstruction; decoherence; quantum jumps; cavity quantum electrodynamics; nonclassical interferometry; optical tests of quantum theory.

VII. Lasers and Laser Applications Laser theory; laser sources; optical spatio-temporal dynamics, including ultrashort pulse generation; design of specific laser systems; laser materials; metrological applications; laser spectroscopy; remote sensing; optical tweezers; LIDAR; industrial applications.

VIII. Nonlinear optics Harmonic generation; stimulated Raman; Brillouin and Rayleigh scattering; multi-wave mixing; frequency conversion and generation of entangled photon states; optical parametric oscillators and amplifiers; phase conjugation; photorefractive and Kerr effects; optical solitons; vortices and nonlinear waveguides.

IX. Nano and Micro optics Near field optics; nano-plasmonics; optical MEMS; photonic crystals; nanocrystals; left-handed materials; metamaterials; rough surfaces; optical properties of nanoscale materials.

X. Matter waves Optics and interferometry of atoms and molecules; cold atoms and molecules; optical lattices; quantum gases, including Bose-Einstein-condensation and degenerate Fermi gases; atom lasers; phase-coherent ensembles.

XI. Quantum information Quantum cryptography; quantum communication; quantum computation; entanglement production, characterization and manipulation; quantum error correction and other methods for protection against decoherence.

XII. Bio and medical optics Tissue engineering; endoscopes; near infrared spectroscopy; cell manipulation; biosensors; cellular surgery; skin optics; laser scanning microscopy; optical coherence tomography.