

# Classification Scheme for APEX

---

## 1. Plasmas, Atomic, Molecular, and Chemical Physics, and Applied Nuclear Physics

- 1.1 Plasma sources and devices (design and characterization)
- 1.2 Plasma diagnostics (techniques and instrumentation)
- 1.3 Plasma-based materials processing
- 1.4 Plasma applications in nanotechnology
- 1.5 General discharge/plasma phenomena and applications
- 1.6 Atoms and molecules
- 1.7 Reaction mechanism, kinetics, and computational chemistry
- 1.8 Electro-, photo-, and plasma chemistry
- 1.9 Nuclear physics and applications (including radioactivity, reactions, and scattering)
- 1.10 Radiation effects and passage through matter
- 1.11 Nuclear engineering and nuclear power studies
- 1.12 Experimental methods and instrumentation for elementary particle and nuclear physics

## 2. Metrology and Instrumentation

- 2.1 Measurement technology (including sensing and control)
- 2.2 Precision measurement
- 2.3 Nanometrology
- 2.4 Measurement standards

## 3. Optics

- 3.1 Fundamental optics
- 3.2 Optical materials
- 3.3 Optical devices and systems
- 3.4 Optical measurement and metrology
- 3.5 Information optics
- 3.6 Vision and color
- 3.7 Biological and medical optics
- 3.8 Near-field optics

## 4. Quantum Electronics

- 4.1 Quantum optics and atom optics
- 4.2 Photonic structures (including photonic crystals, metamaterials, and plasmonics)
- 4.3 Laser systems and materials
- 4.4 Ultrafast/high-intensity lasers
- 4.5 Terahertz technology
- 4.6 Nonlinear optics
- 4.7 Laser spectroscopy and instrumentation
- 4.8 Laser processing and laser ablation

## 5. Optoelectronics and Photonics

- 5.1 Semiconductor lasers and light-emitting devices
- 5.2 Photodetectors
- 5.3 Optical storage devices
- 5.4 Optical modulators, switches, and other light-controlling devices
- 5.5 Electrooptic, magneto-optic, and nonlinear optic waveguides
- 5.6 Optoelectronic/photonic integrated circuits and planar lightwave circuits
- 5.7 Optical fibers

## 6. Thin Films and Surfaces

- 6.1 Carbon-based and diamond films
- 6.2 Oxide electronics
- 6.3 Novel thin film materials
- 6.4 Surface physics and vacuum
- 6.5 Scanning probe microscopy

## 7. Photon and Particle Beam Applications

- 7.1 EUV and X-ray technologies
- 7.2 Electron microscopy
- 7.3 Lithography
- 7.4 Beam-excited surface reactions and processing
- 7.5 Ion beams and applications
- 7.6 Vacuum nanoelectronics
- 7.7 Other beam-related technologies

## 8. Spintronics and Magnetism

- 8.1 Magnetic materials and devices
- 8.2 Spintronic materials and devices
- 8.3 Characterization and related technologies

## 9. Dielectrics and Ferroelectricity

- 9.1 Dielectrics and dielectric thin films
- 9.2 Piezoelectricity and pyroelectricity

- 9.3 Ferroelectricity

## 10. Superconductivity

- 10.1 Fundamental properties
- 10.2 New materials and devices
- 10.3 Processing and growth of films and tapes
- 10.4 Critical current and power applications
- 10.5 Analog applications and related technologies
- 10.6 Junction and circuit fabrication processes

## 11. Organic Molecular Electronics

- 11.1 Fabrication, synthesis, and processes
- 11.2 Optical, electronic, dielectric, and magnetic properties
- 11.3 Electronic functional materials
- 11.4 Optical functional materials
- 11.5 Liquid crystals, polymers, and soft materials
- 11.6 Organic light-emitting diodes
- 11.7 Organic field-effect transistors
- 11.8 Organic solar cells and other optoelectronic devices

## 12. Silicon and Related Materials

- 12.1 Materials science and characterization
- 12.2 Semiconductor surface
- 12.3 Gate stack technology
- 12.4 Interconnect technology
- 12.5 Silicon process technology
- 12.6 Silicon devices and integration technology
- 12.7 Process and device simulation
- 12.8 Optoelectronic properties and devices

## 13. Compound Semiconductors

- 13.1 Exploratory materials/physics/devices
- 13.2 Heterostructures and quantum nanostructures
- 13.3 Process technologies and interface physics
- 13.4 High-speed and functional electron devices
- 13.5 Optoelectronic properties and devices

## 14. Crystal Growth and Characterization

- 14.1 Bulk crystals
- 14.2 II–VI compounds
- 14.3 III–V compounds
- 14.4 III–nitride compounds
- 14.5 Silicon carbide, silicon germanium, and group-IV semiconductors
- 14.6 Oxide and other semiconductors
- 14.7 Fundamentals of epitaxial growth
- 14.8 Characterization, impurities, and defects

## 15. Amorphous and Microcrystalline Materials

- 15.1 Fundamental properties and characterization
- 15.2 Preparation technologies
- 15.3 Solar cells and thin film devices
- 15.4 Fibers and other applications

## 16. Nanoscience and Nanotechnology

- 16.1 Carbon nanotubes, fullerenes, and other carbon nanomaterials
- 16.2 Nanoparticles and supramolecules
- 16.3 Nanowires, nanorods, and nanotubes
- 16.4 Nanoelectronics and related devices
- 16.5 Nanophotonics and related devices
- 16.6 Nanomagnetism
- 16.7 Nanoimprint
- 16.8 Nanoscale manipulation and characterization technologies

## 17. Biomedical Engineering and Applied Biophysics

- 17.1 Biosensing, biochips, and bionanotechnology
- 17.2 Bioimaging and engineering
- 17.3 Brain measurement, imaging, and instrumentation
- 17.4 Bio-inspired integrated circuits and systems
- 17.5 Biomedical materials

## 18. General Applied Physics and Cross-Disciplinary Areas

- 18.1 Particle accelerators
- 18.2 Space and earth science and technology
- 18.3 Environmental engineering
- 18.4 Energy technology
- 18.5 Others