

Frontiers in Theoretical Physics

From Fundamental Theory to Computational and Applied Sciences

ABSTRACT

Modern physics is entering a new era in which fundamental theory, advanced computation, emerging materials, nuclear science, and radiation technologies are becoming increasingly interconnected. Breakthroughs in quantum theory, condensed matter physics, computational modeling, nuclear and radiation physics, high-performance computing, and advanced materials are reshaping our understanding of physical systems while opening new pathways toward technological innovation.

This special session aims to provide a high-level interdisciplinary forum for researchers, academics, and scientists working across the broad landscape of modern physics. It will bring together contributions that advance fundamental understanding, develop powerful theoretical and computational approaches, interpret complex experimental phenomena, and translate physical principles into emerging scientific and technological applications.

Particular emphasis will be placed on theoretical physics, computational physics, condensed matter physics, nuclear physics, radiation physics, quantum physics, and materials science. The session will also highlight the growing role of modern computation, including first-principles calculations, density functional theory, molecular dynamics, Monte Carlo techniques, multiscale modeling, high-performance computing, and data-driven physical modeling.

By integrating theoretical insight, computational innovation, experimental interpretation, and applied physical science, this special session seeks to stimulate high-impact scientific exchange, identify emerging research directions, strengthen interdisciplinary connections, and foster new national and international collaborations. It is intended as a dynamic platform for discussing contemporary questions ranging from the fundamental behavior of matter and radiation to next-generation materials, quantum systems, nuclear technologies, and advanced computational methods.

Session Vision *Connecting fundamental physics with computation, materials, nuclear science, and radiation applications to accelerate discovery and interdisciplinary collaboration.*

SUGGESTED TOPICS

Theoretical & Quantum Physics • Mathematical and fundamental physics • Quantum systems and quantum technologies • Statistical physics, nonlinear dynamics and complex systems	Computational Physics • First-principles and density functional theory methods • Molecular dynamics and Monte Carlo simulations • High-performance, multiscale and data-driven modeling
Condensed Matter & Materials Science • Electronic, magnetic and optical properties of materials • Semiconductors, superconductivity and quantum materials • Nanomaterials, low-dimensional systems, surfaces and interfaces	Nuclear & Radiation Physics • Nuclear structure, reactions and reactor-related physics • Radiation-matter interaction, detection and dosimetry • Radiation shielding, medical and industrial applications

Cross-cutting contributions are also welcome in: advanced instrumentation, detector physics, computational materials discovery, energy-related materials, and other emerging interdisciplinary areas consistent with the session scope.

KEYWORDS

Theoretical Physics • Computational Physics • Condensed Matter Physics • Nuclear Physics • Radiation Physics • Quantum Physics • Materials Science

SUBMISSION INFORMATION

Researchers, academics, postgraduate students, and practitioners are invited to submit original theoretical, computational, experimental, and applied contributions relevant to the scope of this special session. High-quality interdisciplinary studies, innovative computational methodologies, emerging theoretical approaches, advanced materials research, and work addressing contemporary challenges in fundamental and applied physics are particularly welcome. Please send submissions to: Prof. Dr Saleem Qashou

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