Special Issue

Advances in Free-Electron Radiation Sources and Particle Accelerators: Current Research and Future Directions

Message from the Guest Editors

Free-electron radiation sources refer to electromagnetic radiation sources that are driven by free-electron beams exhibiting relatively high kinetic energies. These are typically generated by particle accelerators. Examples of these include free-electron lasers (FELs) and electromagnetic radiation sources based on transition radiation, Cherenkov radiation, and diffraction radiation (Smith–Purcell radiation). When compared with traditional laser sources, free-electron light sources exhibit the advantages of high power and broad spectral coverage, particularly across the spectral regions that traditional laser sources are unable to access, such as the terahertz, ultraviolet, and X-ray regions. This novel characteristic has a broad number of applications across multiple fields. Although these radiation schemes have been the subject of extensive research for decades, recent discoveries in the field of physics have led to increasing attention being paid to them in the past few years.

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