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Providing a solid theoretical background in photon-matter interaction, Nonrelativistic Quantum X-Ray Physics enables readers to understand experiments performed at XFEL-facilities and x-ray synchrotrons. As a result, after reading this book, scientists and students will be able to outline and perform calculations of some important x-ray-matter interaction processes. Key features of the contents are that the scope reaches beyond the dipole approximation when necessary and that it includes short-pulse interactions. To aid the reader in this transition, some relevant examples are discussed in detail, while non-relativistic quantum electrodynamics help readers to obtain an in-depth understanding of the formalisms and processes.

The text presupposes a basic (undergraduate-level) understanding of mechanics, electrodynamics, and quantum mechanics. However, more specialized concepts in these fields are introduced and the reader is directed to appropriate references. While primarily benefiting users of x-ray light-sources, the material is equally of relevance to researchers in various disciplines, such as life sciences, biology, materials science, physics, and chemistry that plan on applying these new facilities in their respective fields.



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Editorial Review

About the Author

Stefan Hau-Riege is the X-ray Science and Technology Group Leader at the Lawrence Livermore National Laboratory (LLNL), where he works on x-ray free-electron-laser interactions with materials, x-ray instrumentation, and ultrafast imaging, drawing on computational and experimental physics. Previously, he worked on extreme-ultraviolet lithography and laser-assisted recrystallization. Dr. Hau-Riege received his Ph.D. in materials science from the MIT in 2000, and a M.S. in solid-state physics and applied mathematics from the University of Hamburg, Germany. He has authored and co-authored more than 100 scientific journal publications, and is co-inventor of more than 20 patents.

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