

|                         |   |
|-------------------------|---|
| 1. Record Nr.           | UNINA9910458435703321   |
| Autore                  | Eichler Jorg <1934->  |
| Titolo                  | Lectures on ion-atom collisions [[electronic resource] ] : from nonrelativistic to relativistic velocities // Jorg Eichler  |
| Pubbl/distr/stampa      | Boston, : Elsevier, 2005  |
| ISBN                    | 1-280-63848-6<br>9786610638482<br>0-08-046111-5   |
| Descrizione fisica      | 1 online resource (273 p.)  |
| Collana                 | North-Holland personal library  |
| Disciplina              | 539.7/57  |
| Soggetti                | Ion-atom collisions<br>Collisions (Nuclear physics)<br>Electronic books.  |
| Lingua di pubblicazione | Inglese   |
| Formato                 | Materiale a stampa  |
| Livello bibliografico   | Monografia  |
| Note generali           | Description based upon print version of record.   |
| Nota di bibliografia    | Includes bibliographical references and index.  |
| Nota di contenuto       | Cover; Contents; Contents; Nonrelativistic collisions; Introduction; Classification of collisions; Units; Quantum formulation; Classical description of the nuclear motion; Semiclassical description; Single-electron approximation; Classical-trajectory Monte Carlo calculations (CTMC); Low-cncrgy collisions: Basis expansions; Coupled-channel description: General outline; Electron translation factors; Molecular orbital model: The Born- Oppenheimer expansion; Molecular orbitals: Correlation diagrams and couplings; Molecular orbital (MO) x-rays; Two levels: Landau-Zener approximation<br>Two levels: Stiickelberg oscillationsMolecular orbitals: Dynamical calculations; Two-center atomic expansions; Mathematical appendix: Single-center basis functions; High-energy collisions: Perturbation theory for direct reactions; The Born expansion; The Magnus expansion; The distorted-wave Born approximation (DWBA); Excitation and ionization: Partial-wave expansion; Ionization: The CDW-EIS approximation; High-energy collisions: Charge transfer; The Oppenheimer-Brinkman-Kramers approximation; The Jackson-Schiff and the Strong-Potential Born approximations<br>Coulomb boundary conditions and gauge transformationsThe |

boundary-corrected first Born (BIB) approximation; The continuum-distorted wave (CDW) approximation; The eikonal approximation; Coupled-channel calculations for transfer at high energies; The Thomas double-scattering mechanism; Relativistic collisions; Relativistic kinematics and fields of moving charges; The Lorentz transformation; Transformation between a moving frame and the laboratory frame; Transformation of differential cross sections; Relativistic motion of interacting point charges; Lienard-Wiechert potentials

The equivalent-photon method Relativistic electron motion; The Dirac equation for a central potential; Bound states in a Coulomb potential; Coulomb-Dirac continuum wavefunctions; Relativistic ion-atom collisions: General theory; Dirac equation for moving Coulomb potentials; Perturbative transition amplitudes; Two-center coupled-channel methods; Asymptotic solutions; Basis states satisfying Coulomb boundary conditions; Numerical solutions on a lattice in position space; Numerical solutions on a lattice in momentum space; Direct reactions: Excitation and ionization

First-order perturbation theory Long-range couplings in perturbation theory; Two-center coupled-channel methods; Calculations on a lattice; Relativistic electron transfer; The cross section in first order; The relativistic eikonal approximation; Two-center coupled-channel methods; Theoretical and experimental cross sections; Frame- and basis-set dependence; Radiative electron capture (REC); The impulse approximation; Some basics: Born approximation for K-shell photoionization and REC; The Stobbe formula for K-shell photoionization and REC; Exact relativistic calculations REC cross sections from exact calculations

---

## Sommario/riassunto

Atomic collisions offer some unique opportunities to study atomic structure and reaction mechanisms in experiment and theory, especially for projectiles of high atomic number provided by modern accelerators. The book is meant as an introduction into the field and provides some basic theoretical understanding of the atomic processes occurring when a projectile hits another atom. It also furnishes the tools for a mathematical description, however, without going deeper into the technical details, which can be found in the literature given. With this aim, the focus is on reactions, in which only

---