
Preface

The advancement of particle accelerators is now well into its second century considering Röntgen's x-ray tube to be a particle accelerator. This scientific field, one of ongoing development, has achieved maturity, not stagnation. Accelerators now pervade nearly every facet of both modern scientific research and everyday life. They are utilized in virtually all branches of science ranging from the frontiers of physics (particle, nuclear, atomic, and condensed matter) to engineering, chemistry, biology, geology, and the environmental sciences. Important practical applications of accelerators are now found in industrial applications and even in agriculture. Accelerators are now ubiquitous in medicine. Among "radiological installations," particle accelerators are now the type most commonly encountered by members of the public.

This book is developed from a graduate course taught at the U.S. Particle Accelerator School (USPAS) beginning in 1993. This all began in 1992 when the founding director of USPAS, Melvin Month of Brookhaven National Laboratory, identified the need for the USPAS to offer a course on this topic. Mel then conspired with A. Lincoln Read, a prominent Fermilab physicist, to motivate Fermilab Director John Peoples, Jr., to "conscript" one of the authors (JDC), at that time serving as the head of Fermilab's Environment, Safety, and Health Section, to set time aside from considerable administrative duties to develop a course on this subject and deliver it at the upcoming USPAS Session at Florida State University in January 1993. Success was apparently achieved because the course has been conducted at 13 subsequent USPAS sessions. This success reflects the contributions of following people in addition to the authors of this book who have served as instructors in the USPAS course: Vernon Cupps, Nancy Grossman, Lincoln Read, Diane Reitzner, Sayed Rokni, Reginald Ronningen, Scott Schwahn, Kamran Vaziri, and Vaclav Vylet.

Consolidating this material into a book has been proposed by all of the directors of USPAS and pushed toward realization by one of them; William Barletta. The development of the material that comprises this book has been an ongoing effort attempting to keep up with developments in the field. The content has been selected to address the major elements of radiation physics issues that are encountered at accelerators of all particle types and energies. Some topics not commonly thought to be within the domain of the discipline of health physics are included at an introductory level in support of the theme of the book: charged particle optics, synchrotron radiation "light" sources, meteorology, and hydrogeology. The goal of this work is to provide a solid general background in the subject. The hope is that this book provides a basis for further knowledge development. Some readers may be disappointed to find that the operation of modern Monte Carlo codes is not covered in specific detail. Due to the ever-changing improvements being made to these codes, it is believed that instruction in the details is best left to the sponsors of these important and highly effective tools.