

**THE
STANFORD
TWO-MILE
ACCELERATOR**

THE STANFORD TWO-MILE ACCELERATOR

R. B. Neal, General Editor
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THE STANFORD TWO-MILE ACCELERATOR

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FOREWOF

This book documents the design and construction of the two-mile electron linear accelerator located at Stanford University. We have felt that the unprecedented size and complexity combined with the importance of this new installation generated a real responsibility on our part to publish in full the technical features of the installation.

The major brunt of this book has fallen on the shoulders of Dr. Richard B. Neal. He has carried out the mammoth job of collecting and editing the information, in addition to his regular work as Associate Director of the Stanford Linear Accelerator Center. We are all deeply indebted to him for this effort which extended over many long hours.

The work described in this book has been supported in its entirety by the U.S. Atomic Energy Commission and we would here like to express our gratitude and that of the entire scientific community.

*W. K. H. Panofsky, Director
Stanford Linear Accelerator Center*

PREFACE

Although this accelerator is the largest of its kind in the world, there are many aspects of its design which are pertinent to other shorter machines of the same type. Indeed, most accelerators whether of protons or electrons, whether large or small, whether linear or circular, share to a greater or lesser degree the problems of design, construction, and operation which are discussed herein. It is expected, therefore, that the design solutions which are described will be of general interest to a broad group of accelerator designers, builders, and users. It is hoped that the technical material in this book will also be of interest to engineers and students interested in high-power pulse techniques, special fabrication problems, and other topics of engineering interest.

The number of co-authors of this book totals more than ninety. Their efforts have been divided into twenty-seven chapters. The names of the authors contributing to each chapter are given on the title page of that chapter; one of them has generally served as the editor of the chapter as indicated. The initials of the particular author of a chapter section are given immediately after the listing of the section title. For various reasons, some individuals who made major contributions to a given topic may not appear among the listed co-authors. Attempts have been made, however, to give recognition to their work either within the appropriate chapter or among the references and acknowledgments given at the end of the chapter.

The overall preparation of this book was coordinated by an editorial committee consisting of D. W. Dupen, H. A. Hogg, G. A. Loew, and R. B. Neal. The committee has permitted a certain amount of redundancy in the presented material so that the reader will not find it necessary to turn from chapter to chapter to obtain a reasonably complete account of a given subject. Excessive overlap and repetition has, hopefully, been avoided.

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Attention has been given to standardizing units, symbols, and nomenclature throughout the book. However, many exceptions to such uniformity have been made to allow descriptions and treatment of subject matters to be given in terms which are most familiar to workers in a particular field or discipline.

The editors faced the usual problems of deciding where and when to establish an information cutoff for material being prepared for publication. It was decided that the principal subject matter to be covered in this book would include the site, the buildings and utilities, and the components and systems of the accelerator and the beam switchyard. The associated physics research equipment and the research program have been described to complete the overall view, but only briefly. The descriptions and results generally apply to the status as of July 1967.

It is perhaps inevitable that the contributions of various individuals to this large and complex program have not, because of oversight, been properly recognized in this book. Regrets and apologies for these unintended omissions are hereby tendered.

February 1968
Stanford, California

Editorial Committee

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