

BOOSTER

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DESIGN MANUAL

(Rev. 1, October 1985)

ACCELERATOR DEVELOPMENT DEPARTMENT
Brookhaven National Laboratory

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PREFACE

To meet the need of new physics research, there are three major objectives for the AGS Booster Project.

The first objective is to increase the proton intensity in the AGS by a factor of four (to 6×10^{18} ppp). This can be achieved by increasing the proton energy from 200 MeV to 1.5 GeV in the Booster and injecting the protons into the AGS four times per AGS pulse. Thus, a fast-cycling magnet guiding and focusing system (and its corresponding power supply system) has to be constructed, and a radio frequency acceleration and control system under heavy beam loading is required.

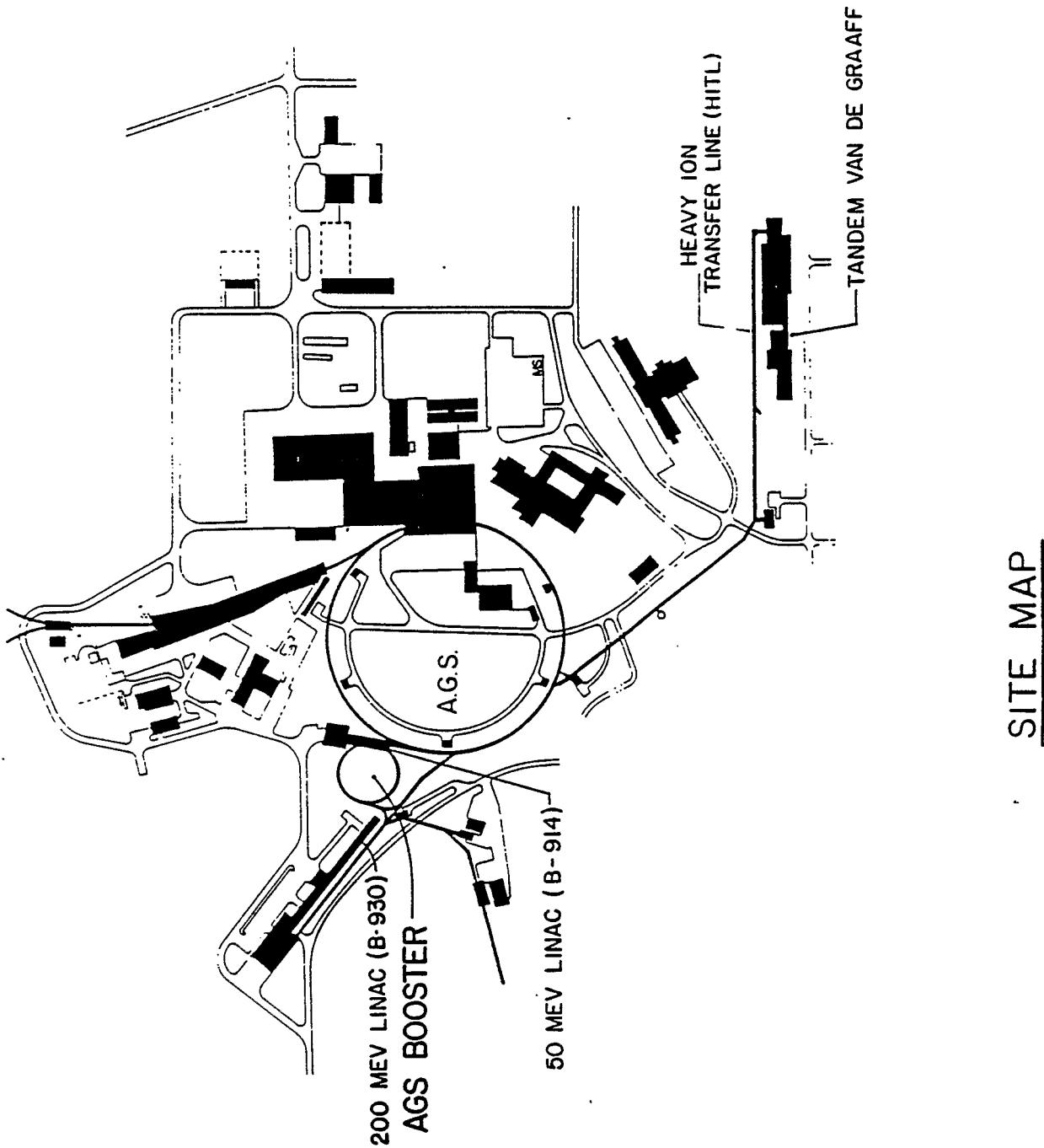
The second objective is to increase the AGS polarized proton intensity by a factor of twenty (to 10^{12} ppp). This objective can be achieved by accumulating 20 to 25 pulses of polarized protons from the linac while the AGS is in the acceleration and extraction portion of its cycle. Therefore, good field quality and minimal depolarization resonances have to be achieved in the Booster.

The third objective is to accelerate heavy ions up to gold in the Booster for AGS and eventually for RHIC. This objective requires the Booster to accept heavy ions at one-third of the proton injection field and to avoid electron stripping or capture for all species. Therefore, a high vacuum (three orders of magnitude better than required for normal proton operation) is needed. Furthermore, additional radio frequency systems to accelerate heavy ions at lower frequency are required. Extension of the sensitivity and linearity of all instrumentation to lower frequency and to three orders of magnitude lower intensity has to be accomplished.

The Booster is a circular accelerator with a circumference of about 200 meters, one-fourth that of the AGS, and is located at the north corner of the intersection between the AGS and the 200 MeV linac (see figure on following page). When completed, the Booster will receive proton beams from the 200 MeV linac and heavy ion beams from the existing Tandem Van de Graaf, and will provide higher energy beams for the AGS through a common extraction port and beam transfer line.

The design manual of the AGS Booster is a compilation of required specifications, characteristics and locations of the components necessary to build the machine. As such, its purpose is to bridge the transition from the conceptual design to the engineering and fabrication of the accelerator and to reflect design changes necessitated by future construction progress.

This manual reflects the contributions from Booster staff and many members of the AD and AGS Departments. Names of coordinators of each chapter or section are listed at the end of a particular chapter or section. The editorial staff is the Parameter



Committee of the Booster Project; Y. Y. Lee, Chairman, G. Danby, F. Dell, S. Y. Lee, E. Raka, A. Ruggiero, A. Soukas, and R. Thomas, secretary.

The revision of the design manual is the responsibility of the project manager. All suggested changes, errors or omissions should be brought to his attention. After review, the actual changes will be made by authorized personnel and the new sheets will be issued to all holders of numbered manuals which will be assembled in ring binders.

The manual itself is structured for easy changes. Such changes will result from the on-going design process as mentioned above or may be simply due to the correction of errors. Missing entries mean that these values have not been calculated or verified at the date of printing. In order to avoid confusion caused by outdated information, each page of the manual is coded as follows:

1) Page Revision

This number will be changed sequentially each time a change is made to the contents of a page. If a change requires the number of pages to be increased, then all succeeding pages in that chapter are revised and/or renumbered.

2) Date

This shows the date on which the page was printed.

In conjunction with the Booster Design Manual, which specifies the design of the technical components, there are two related documents. The Booster Management Plan provides the baseline and controls which BNL and the Department of Energy will follow to meet the technical, cost, and schedule goals. The Preliminary Safety Analysis Report describes the conventional facilities and analyzes the safety issues in the radiation, fire, electrical, and personnel protection areas both during the construction period and in future operation.

W. T. Weng