MEGAGAUSS PHYSICS AND TECHNOLOGY

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EDITOR'S PREFACE

The generation and use of megagauss magnetic fields have been subjects of research and development in laboratories around the world for over a quarter of a century. Research goals have included the development of compact, short-pulse, electrical power sources and the production of ultrahigh magnetic field strengths over significant experimental volumes. Energies measured in megajoules, currents in megamperes and timescales of microseconds are not uncommon in such work. Phase changes, insulator breakdowns, and local destruction of the apparatus are also frequently encountered. Some efforts have involved the use of high explosive systems, developing methodologies rather distinct from those of a normal physics laboratory. Manipulation of magnetic flux to exchange energy between high speed, electrically conducting flows and high strength electromagnetic fields remains, of course, a basic interaction of classical physics.

The remoteness of the necessary experimental sites (at least in many instances) and the various national concerns for security of defense-related research have often limited the flow of information between investigators of separate organizations, working in common areas of technical concern. Occasionally, however, it has been possible for the community of scientists and engineers engaged in work on high magnetic fields and related high energy density systems to gather together and exchange results and plans, successes and failures. The first such international gathering was in 1965 at the Conference on Megagauss Magnetic Field Generation by Explosives and Related Experiments, Frascati, Italy. The proceedings of the conference were published by Euratom (EUR 2750.e) and have served as a useful reference for many years.

The present volume, *Megagauss Physics and Technology*, is based on papers given at the Second International Conference on Megagauss Magnetic Field Generation and Related Topics, held in Washington, D.C., 30 May-1 June 1979. It may be hoped that this work will also be a useful reference. Topics at the Conference ranged from magnetic flux-compression generator design to applications of high magnetic field techniques for controlled thermonuclear fusion, and included discussions of diagnostic methods, accelerator concepts, switching, and theoretical modeling. Some topics are of passing or recurrent interest, while others are more fundamental or utilitarian in nature.

As might be expected, the sixty technical papers presented here have many points of contact and overlap with each other. Often, reports of both theoretical and experimental work on several subjects are included within a single paper. The arrangement of papers has, therefore, generally followed the

order of presentation at the Conference, thereby at least preserving some mnemonic advantage for the Conference participants. It should be noted, however, that nine Soviet papers which were synopized at different times during the Conference are collected at the end of the volume since closely-related aspects of research efforts at two laboratories are reviewed in these papers. (Careful comparison with the actual program of the Conference would reveal to those so inclined that there are some other additions, omissions, and rearrangements, due primarily to limited editorial resources relative to nonsubmission of papers and forms, inadequate figures, or late arrivals.)

The editorial work involved two close screenings of the re-typed manuscripts to eliminate typographical errors, and to provide occasional adjustments of language. In the latter regard, English translations of technical expressions have generally been left in the form supplied by the authors, since special points of view may be indicated by language usage. Comparison with other literature is also facilitated by this policy. Some phrases, however, typically involving less subtle features such as suffixes, have been adjusted.

At various places, omissions in the text have occurred without a reasonably certain clue as to the author's intention. In such circumstances, since the authors have not been available for ready consultation during the editorial process, a best estimate is provided, with the notation [ed. est.]. Other notational policies are the use of italics for algebraic symbols, bold-face italics for vectors, parentheses for equation numbers, and brackets for reference numbers. No attempt has been made to verify the accuracy of the mathematics presented by various authors. Indeed, technical review was not provided (even though the editor had considerable reservations in some instances) and no endorsement of the scientific merit or validity of the reported efforts should be inferred by presentation in this volume. Much of the material, however, was discussed at the Conference itself and was thereby subjected to community review. Correction of significant errors (especially those introduced by the editorial process) can be attempted by contacting a member of the Organizing Committee of the Conference. An errata sheet for the volume may then be generated and distributed at a future date. A list of organizational mailing addresses has been provided for direct correspondence with the authors.

The Conference, known to its friends as Megagauss II, was possible due to the considerable contributions of the Organizing Committee and Sponsoring Organizations listed on the following page, and to the enthusiastic response of the Conference participants and authors. Special appreciation is due to Ms. Francine Rosenberg who served as the Conference Secretary and handled the great many details involved in preparing and carrying out the tasks of the Conference, thereby ensuring its success.

The text of the present volume was prepared through the gracious efforts of Mrs. Dora Wilbanks and her staff using the computer-assisted composition system at the Naval Research Laboratory. The considerable tasks of arranging the text by hand, correction and re-setting were accomplished by the dedicated effort of Mrs. Judy Kogok. Errors and delays in publication of this volume are due to the editor:

P. J. Turchi

SECOND INTERNATIONAL CONFERENCE ON MEGAGAUSS MAGNETIC FIELD GENERATION AND RELATED TOPICS
29 May - 1 June 1979
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