

CONTENTS

I. Operating Characteristics and Design Features	1-128
D. J. CLARK, J. R. RICHARDSON and B. T. WRIGHT, Design and operation of the U.C.L.A. 50 MeV spiral-ridge cyclotron	1
A. J. COX, D. E. KIDD, W. B. POWELL, B. L. REECE and P. J. WATERTON, Operation of a 40-inch radial ridge cyclotron	25
E. L. KELLY, General description and operating characteristics of the Berkeley 88-inch cyclotron	33
J. R. RICHARDSON, H. WILLAX and W. B. JONES, Note on a spill beam from the 88-inch cyclotron	41
R. J. JONES, E. D. HUDSON, R. S. LIVINGSTON, R. S. LORD, M. B. MARSHALL, W. R. SMITH, W. H. WHITE Jr. and R. E. WORSHAM, Unique features in the Oak Ridge isochronous cyclotron	46
D. A. LIND, J. J. KRAUSHAAR, R. SMYTHE and M. E. RICKEY, General design features of the University of Colorado 52-inch cyclotron	62
M. E. RICKEY and R. SMYTHE, The acceleration and extraction of negative hydrogen ions in the C.U. cyclotron	66
D. L. JUDD, Electric dissociation of negative hydrogen ions in cyclotrons and synchrocyclotrons	70
A. LUCCIO, G. PAVANATI, F. RESMINI, C. SUCCI and G. TAGLIAFERRI, Relativistic cyclotron for the University of Milan	74
A. CABRESPINE and M. P. BOURGAREL, Shimming of a variable energy, sector-focused isochronous cyclotron by means of different permeability metals	81
N. F. VERSTER, H. L. HAGEDOORN, J. ZWANENBURG, A. J. J. FRANKEN and J. GEEL, Some design features of the Philips AVF prototype	88
W. C. PARKINSON and R. S. TICKLE, The University of Michigan 83-inch cyclotron, I, General description	93
R. S. TICKLE, The University of Michigan 83-inch cyclotron, II, The magnetic field	98
P. BRUINSMA and W. C. PARKINSON, The university of Michigan 83-inch cyclotron, III, The r.f. system	102

CONTENTS

J. BARDWICK, J. M. LAMBERT and W. C. PARKINSON, The University of Michigan 83-inch cyclotron, IV, The external beam handling system	105
K. G. STANDING, J. J. BURGERJON and F. KONOPASEK, The University of Manitoba cyclotron	111
J. D. LAWSON, Studies for a 70-inch versatile cyclotron	114
J. A. JUNGEMAN, N. F. PEEK and C. G. PATTEN, A preliminary report on the 22-inch spiral ridge cyclotron at the University of California, Davis	120
F. T. HOWARD, Catalogue of isochronous cyclotrons	125
II. Magnetic Fields	129-176
D. A. LIND, M. E. RICKEY and B. M. BARDIN, Magnetic field design and measurement for the Colorado 52-inch cyclotron	129
J. H. DORST, Full-scale magnetic measurements on the Berkeley 88-inch cyclotron	135
J. H. COUPLAND and K. J. HOWARD, Some model magnet measurements and their application to the design of a 70-inch spiral ridge cyclotron	148
E. D. HUDSON, R. S. LORD, M. B. MARSHALL, W. R. SMITH and E. G. RICHARDSON Jr., Achievement and measurement of the ORIC magnetic field	159
W. H. WHITE Jr., Magnet regulators for ORIC	170
III. Radio Frequency Systems	177-200
K. R. MACKENZIE, S. PLUNKETT and E. L. PETERSEN, Characteristics of the UCLA cyclotron radiofrequency system	177
B. H. SMITH, Radiofrequency system of the Berkeley 88-inch cyclotron	184
J. SANADA, I. HAYASHI and A. SUZUKI, Comparison between variable-energy synchro-cyclotron and sector-focused cyclotron	194
N. F. ZIEGLER, A high-voltage regulator for the ORNL 86-inch cyclotron	197
IV. Orbit Theory	201-293
H. L. HAGEDOORN and N. F. VERSTER, Orbits in an AVF cyclotron	201
F. FER, Analytical theory of betatronic stability in sector-focused accelerators	229
M. M. GORDON and W. S. HUDEC, Effects of field imperfections on radial stability in a three-sector cyclotron	243
M. M. GORDON, The electric gap-crossing resonance in a three-sector cyclotron	268
M. M. GORDON, Fixed-point orbits in the vicinity of the $\nu_r = N/3, N/4$ and $N/2$ resonances	281

V. Computer Programs	295-345
H. C. OWENS, Three computer programs for calculating cyclotron orbits	295
R. H. BASSEL, R. S. BENDER and J. G. INNES, Analyzing methods for ORIC magnetic fields	303
A. A. GARREN, Calculation of cyclotron trim-coil currents for field optimization by linear programming methods	309
J. D. YOUNG, A. S. KENNEY and A. A. GARREN, Computational procedures in the adjustment of a cyclotron magnetic field by trim coils	323
N. F. VERSTER and H. L. HAGEDOORN, Computer programs for an AVF cyclotron	327
H. L. HAGEDOORN and N. F. VERSTER, Analogue computer studies for an AVF cyclotron	336
G. PARZEN, J. C. ANDERSON, M. R. STORM, J. M. MAYNARD and H. L. CARLSON, A computer program to investigate orbit stability in circular accelerators	338
T. I. ARNETTE, H. G. BLOSSER, M. M. GORDON and D. A. JOHNSON, Cyclotron programs for a small computer	343
VI. Central Region	347-386
H. A. WILLAX and A. A. GARREN, Center-region geometry of the Berkeley 88-inch cyclotron	347
P. G. WATSON, Development of the magnetic cone for the center of the Berkeley 88-inch cyclotron	362
M. REISER, Central orbit program for a variable energy multi-particle cyclotron	370
M. M. GORDON and H. G. BLOSSER, Acceleration of particles into stable orbits in an isochronous three-sector cyclotron	378
VII. Meson Factories	387-478
R. P. HADDOCK, The role of the pion factory in elementary particle physics	387
L. SMITH, Comparison of accelerator types	397
R. WALLACE, Shielding and activation considerations for a meson factory	405
J. P. BLASER and K. STEIMEL, Proposal for a constant-frequency sector-focussed cyclotron for protons of 450 MeV	417
M. BARBIER, P. LAPOSTOLLE, M. MORPURGO and N. VOGT-NILSEN, On the design of an isochronous cyclotron meson factory	425
R. S. LIVINGSTON, E. D. HUDSON, R. J. JONES, R. S. LORD, J. E. MANN, J. A. MARTIN, F. M. RUSSELL, N. F. ZIEGLER and A. ZUCKER, Concepts of an Mc^2 cyclotron	438

CONTENTS

W. MÜLLER and W. WOLFF, Considerations on the design of a spiral ridge cyclotron for 450 MeV protons	447
J. R. RICHARDSON, Preliminary considerations on meson cyclotrons	457
J. A. MARTIN and J. E. MANN, Beam characteristics in cyclotron Analogue II	461
R. J. JONES, Remarks on tune-up of Analogue II	469
R. W. BOOM, K. S. TOTH and A. ZUCKER, Radiation survey at the LRL 184-inch cyclotron	472
VIII. Beam Extraction	479–547
E. A. FINLAY, A proposal for linear regenerative extraction from the Birmingham radial-ridge cyclotron	479
H. G. BLOSSER, M. M. GORDON and T. I. ARNETTE, Resonant extraction from three-sector low-spiral cyclotrons	488
M. K. BRUSSEL, J. S. ALLEN and L. E. ERNEST, Beam extraction from the University of Illinois sector-focussed cyclotron	520
A. A. GARREN, D. L. JUDD, L. SMITH and H. A. WILLAX, Electrostatic deflector calculations for the Berkeley 88-inch cyclotron	525
IX. Mechanical Design	549–587
R. PETERS, Metal gaskets for the Berkeley 88-inch cyclotron	549
R. PETERS, Mechanical features of the electrostatic deflector for the Berkeley 88-inch cy- clotron	552
J. M. HAUGHIAN and R. J. BURLEIGH, The ion-source mechanism for the Berkeley 88-inch cyclotron	559
K. F. MIRK, Mechanical features of the r.f. system for the Berkeley 88-inch cyclotron . . .	562
K. W. EHLERS, Design and development of the ion source for the Berkeley 88-inch cyclotron	571
L. R. GLASGOW and R. J. BURLEIGH, Trim-coil construction for the Berkeley 88-inch cyclotron	576
R. SMYTHE, University of Colorado 52-inch cyclotron dee design	582
R. DE FOREST, A Hall probe assembly for the Berkeley 88-inch cyclotron magnet	584
X. Diverse Topics	589–638
H. ATTERLING, Beam-transport system for the Berkeley 88-inch cyclotron	589
C. G. DOLS, Measurement of beam phase of the Berkeley 88-inch cyclotron	595

CONTENTS

W. H. WHITE Jr., B. DUELLI and R. J. JONES, Beam-phase measurement studies	601
T. K. KHOE, A method to increase the duty factor of an isochronous cyclotron	606
A. I. YAVIN, On the duty cycle of cyclotrons	610
W. L. DEXTER and B. H. SMITH, Application of silicon diodes to cyclotron oscillator and magnet power supplies	613
H. BRÜCKMANN, Ferroelectric modulators	622
T. H. MYHRER and W. P. CARPENDER, Building, site, utilities and services for the Berkeley 88-inch cyclotron	627
R. J. BURLEIGH, Costs and manpower for the Berkeley 88-inch cyclotron	634
List of Delegates	640
Author Index	645