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BIBLIOGRAPHY OF PARTICLE ACCELERATORS - JULY 1948 to DEC. 1950

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Bonnie E. Cushman

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Berkeley, California

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Introduction

This bibliography is a supplement to that compiled and edited by E. Thomas, P. Mittelman, and H. H. Goldsmith, issued July 1, 1948 as BNL-L-101. The journals searched were Chemical Abstracts; Science Abstracts, Section A (Physics) and Section B (Electrical Engineering); Nuclear Science Abstracts; and Nucleonics. The period covered was June 1948 through December 1950. News briefs are not included in the list, nor is the majority of reports published by various institutions concerning progress in the construction of their particle accelerators. Information pertaining to particle accelerators was obtained primarily from a list of questions sent to institutions throughout the world. It is hoped that both the bibliography and list of accelerators are fairly complete. Notification of omissions and inaccuracies will be greatly appreciated.

BIBLIOGRAPHY OF PARTICLE ACCELERATORS

JULY 1948 TO DECEMBER 1950

General

Atomes 3, 337-344 (1948)
The machine giants of nuclear physics. In French.

Brobeck, W. M.
Accelerating atomic particles. Physics Today 1, No. 6, 27-30 (1948).

Burrill, E. Alfred
The accelerator conference. Physics Today 1, No. 5, 12-16 (1948).

Cardwell, D. W.
Electrical engineering for atomic energy. AECD-2335, Sept. 10, 1948. 20 p.

Chew, Geoffrey F., and Moyer, Burton J.
High energy accelerators at the University of California Radiation Laboratory. American Journal of Physics 18, 125-36 (1950).

Chew, Geoffrey F., and Moyer, Burton J.
High energy accelerators at the University of California Radiation Laboratory. UCRL-444, Sept. 9, 1949. 39 p.

Chick, D. R., and Pentz, M. J.
A survey of particle accelerators in the United Kingdom. Dec. 1948. 18 p. A-24(AEI). Associated Electrical Industries, Ltd.

Dobbie, L. G.
Particle accelerators, general. Bibliography. Australia, Aug. 1948. 5 p. NP-1070.

Elias, J. B.
Accelerators of electric particles. Revista de Geofisica 8, 115-32 (Apr.-Sept. 1949). In Spanish.

Engineering 169, 734-5 (1950)
The Harwell Atomic Energy Research Establishment.

Farly, George M.
Pulsed power particle accelerators. UCRL-693, May 4, 1950. 2 p. Nuclear Science Abstracts 4 (1950), Abstract 4686 in entirety.

Fry, D. W.
High-energy particles and machines for their acceleration. Nature 166, 580-1 (1950).

Grinberg, A. P.
New accelerators of charged particles; a review of published data. Part I. Zhurnal Teknicheskoi Fiziki 19, 1-29 (1949); Part II. Zhurnal Teknicheskoi Fiziki 19, 153-83 (1949). In Russian.

Heyn, F. A.
Apparatus for acceleration of particles. Nederlandsch Tijdschrift voor Natuurkunde 15, 45-73 (1949). In Dutch.

Kilgore, L. A., Boyer, J. L., and Hague, C. S.
Power for atomic accelerators. Atomics 6, No. 3, 5-12 (1950).

Kilgore, L. A., Boyer, J. L., and Hague, C. S.
Power for atom smashers. Westinghouse Engineer 10, No. 2, 115-118 (1950).

Lapostolle, P.
The accelerators of electrons and particles. Revue Générale de l'Électricité 57, 473-80 (1948).

Livingston, M. S.
Particle accelerators. Advances in Electronics 1, 269-316 (1948).

McMillan, Edwin M.
High energy accelerators. Helvetica Physica Acta 23, Supp. 3, 11-26 (1950).

Scientific American 179, No. 4, 18-19 (1948).
World's accelerators. Map.

Simpson, O. C.
Some engineering problems of atomic energy research. Mechanical Engineering 70, 729-32 (1948).

Wahlin, H. R.
High speed atoms. Wisconsin Engineer 52, No. 5, 13-14 (1948).

Woodyard, J. R.
High energy particle accelerators. Electrical Engineering 67, 759-67 (1948).

Betatrons

Adams, G. D.
A method of increasing betatron yield. Review of Scientific Instruments 19, 607-608 (1948).

Adams, G. D., et al.
Techniques for application of the betatron to medical therapy. American Journal of Roentgenology and Radium Therapy 60, 153-7 (1948).

Beama Journal for the British Electrical Industry 55, 313-18 (1948)
The work of the BTH Research Laboratory.

Bierman, A., and Oele, H. A.
Betatrons with and without iron yokes. Phillips Technical Review 11, 65-78 (1949).

Bierman, A.
A new type of betatron without an iron yoke. Nature 163, 649-50 (1949).

Bosley, W., et al.
A 20 Mev betatron. Journal of the Institution of Electrical Engineers 95, Part I, 352-8 (1948).

Bosley, W., et al.
X radiation from a 20 Mev betatron. Nature 161, 1022-34 (1948).

Charlton, E. E., and Baldwin, G. C.
Nuclear research with the 100 Mev betatron. Proceedings of the National Electronics Conference 2, 650-72 (1946).

Courant, E. D., and Bethe, H. A.
Electrostatic deflection of a betatron or synchrotron beam. Review of Scientific Instruments 19, 632-37 (1948).

dePackh, D. C., and Birnbaum, M.
Theory of the capture process in a betatron-injected synchrotron. Review of Scientific Instruments 21, 451-6 (1950).

Dietz, T. W., and Dickinson, T. M.
Electronics applied to the betatron. Proceedings of the Institute of Radio Engineers 37, 1171-8 (1949).

Dobbie, L. G.
Betatron. Bibliography. Australia, Aug. 1948. 4 p. NP-1229.

Dosse, Joachim
The betatron. Revue Scientifique 86, 357-68 (1948). In French.

Engineering 167, 55-8 (1949)
16 Mev betatron at the Clarendon Laboratory, Oxford.

Goward, F. K.
Betatron injection into synchrotrons. Atomic Energy Research Establishment Report No. AERE-G/R-191, Apr. 23, 1948. 33 p.

Goward, F. K.
Betatron injection into synchrotrons. Proceedings of the Physical Society (London) 62A, 617-31 (1949).

Goward, F. K.
Betatrons and synchrotrons. Physics in Industry Series (Institute of Physics), Acceleration of Particles to High Energies 1950, 14-28.

Goward, F. K., and Dain, J.
Discussion on "A 20 Mev Betatron." Proceedings of the Institution of Electrical Engineers 96, Part I, 85-87 (1949).

Goward, F. K., et al.
Quarter-wavelength coaxial line resonators for betatron-started synchrotrons. Institution of Electrical Engineers Paper No. 875 (1949), 9 p.; Proceedings of the Institution of Electrical Engineers 96, Part III, 508-16 (1949).

Gregg, E. C., Jr.
Design of a 30 Mev biased betatron. Physical Review 73, 95 (1948).

Gregg, E. C., Jr.
Measurement of betatron guiding fields during electron ejection. Review of Scientific Instruments 20, 841 (1949).

Gregg, E. C., Jr.
Variation of the equilibrium radius with time in a flux-force field-biased betatron. Physical Review 75, 1633 (1949).

Gund, Konrad
The betatron (electron centrifuge). Das Elektron in Wissenschaft und Technik 1, 389-98 (1947); Chemisches Zentralblatt 1948, I, 1091.

Gund, K.
Electron accelerator for six million volts. Nachrichten der Academie der Wissenschaften in Göttingen, Mathematisch-physikalische Klasse.— Math.-physik.-chem. Abteilung 1946 No. 1, 9-16.

Gund, K., and Paul, W.
Experiments with a six Mev betatron. Nucleonics 7, No. 1, 36 (1950).

Harrington, E. L., et al.
The betatron building and installation at the University of Saskatchewan. Science 110, 283-85 (1949).

Heymann, F. F.
Contraction of the instantaneous orbit at injection in a betatron. Physical Review 75, 1951-52 (1949).

Hinteregger, Hans
General betatron theory. Sitzungberichte der Österreichischen Akademie der Wissenschaften, Abteilung IIa, 156, 299-334 (1948).

Hull, Gordon F., Jr.
High frequency betatron. Office of Naval Research, London, Technical Report No. ONRL-48-50, Apr. 20, 1950. 4 p.

Jahn, H., and Kopfermann, H.
On the radial oscillations of the electrons in a betatron. Annalen der Physik, Leipzig, 6, 305-20 (1949). In German.

Katz, L., et al.
Integrator-expander circuits for the control of the maximum x-ray energy from the betatron. Canadian Journal of Research 28A, 113-19 (1950).

Kerst, Donald W. (to the Board of Trustees of the University of Illinois, Champaign, Ill.)
Betatron injector structure. U.S. Patent 2,497,891, Feb. 21, 1950.

Kerst, D. W., et al.
Betatron model. Physical Review 75, 330 (1948).

Kerst, D. W., et al.
An 80 Mev model of a 300 Mev betatron. Review of Scientific Instruments 21, 462-80 (1950).

Kerst, D. W.
The modulated betatron. AECD-2287 (LADC-516) Dec. 15, 1947. Pp. 1-37.

Kerst, D. W. et al.
Operation of a 300 Mev betatron. Physical Review 78, 297 (1950). Letter.

Kerst, D. W.
A process aiding the capture of electrons injected into a betatron. Physical Review 74, 503-4 (1948).

Kerst, D. W. (to U.S. Secretary of the Navy)
Stereoscopic x-ray pictures with betatron. U.S. Patent 2,473,956, June 21, 1949.

Kollath, R., and Schumann, G. Z.
Researches on a 15 mV betatron. Zeitschrift für Naturforschung 2a, 634-42 (1947). In German.

Kopfermann, H., and Paul, W.
Experimental investigation of an electron accelerator for six Mev. Nachrichten der Akademie der Wissenschaften in Göttingen, Mathematisch-physikalische Klasse, Math.-physik.-chem. Abteilung 1946, No. 1, 17-18.

Johns, H. E.
The betatron in cancer therapy. Nucleonics 7, No. 4, 76 (1950).

Lasich, W. B., Muirhead, E. G., and Wright, I. F.
Azimuthal variations of the betatron field. Journal of Scientific Instruments 26, 91-2 (1949).

Latham, R., and Pentz, M. J.
High current betatron conditions. Letter in Nature 164, 485-6 (1949).

Lawson, J. D.
The effect of doughnut height and gun emission on the output of a betatron. Atomic Energy Research Establishment Report No. AERE-Memo-El/M2, Feb. 23, 1949. 4 p.

Muehlhause, C. O., and Friedman, H.
Measurement of betatron radiation with G.M. counter. Physical Review 69, 691-2 (1946).

National Bureau of Standards (U.S.) Technical News Bulletin 34, 112-15 (1950).
Radiation Physics at the National Bureau of Standards.

Orlin, J. J.
Determination of the pole faces of a betatron by a model. Bergens Museums Arbok (No. 1) Paper 5 (1949). 9 p.

Pennsylvania, University of
Annual report on nuclear research. June 30, 1950. 20 p. NP-1671.

Picht, J.
On the theory of the acceleration of an electron in a magnetic alternating field. (Contribution to the Theory of the Rheotron or Betatron.) I. Optik 6, 40-55; II. Optik 6, 61-97; III. Optik 6, 133-44 (1950). In German.

Quastler, H., et al.
Techniques for application of the betatron to medical therapy. American Journal of Roentgenology and Radium Therapy 61, 591-625 (1949).

Rushforth, L., Morrison, S. T., and Brett, J. G.
A 15-inch glass betatron toroid. BTH-Activities 19, 357-62 (1948).

Schwartz, E.
Electron optics of the betatron. Zeitschrift für Naturforschung 4a, 198-204 (1949). In German.

Skaggs, L. S.
Depth dose of electrons from the betatron. Radiology 53, 868-73 (1949).

Skaggs, L. S., et al.
Development of the betatron for electron therapy. Radiology 50, 167-73 (1948).

Skaggs, L. S., Laughlin, J. S., and Lanzl, L. H.
Technique of producing an external beam of electrons from the betatron. Physical Review 73, 1223 (1948).

Wang, P. K. S., and Wiener, M.
Spectral analysis of 10 Mev betatron radiation by nuclear emulsion. Physical Review 76, 1724-5 (1949).

Watson, H. H. H.
The effect of gas scattering on betatron output. Proceedings of the Physical Society (London) 62B, 206-7 (1949).

Westendorp, Willem F. (to General Electric Co., Schenectady, N. Y.)
Apparatus for imparting high energy to charged particles. U.S. Patent 2,480,169, Aug. 30, 1949.

Westendorp, W. F., and Elder, F. R.
Electron gun emission and x-ray output for three betatrons. Physical Review 76, 445 (1949). Letter.

Wideroe, R.
A new method for displacing the electron beam in a betatron (synchrotron). Note in Review of Scientific Instruments 19, 401-2 (1948).

Wilkins, J. J.
Betatron-starting in electron synchrotrons. Philosophical Magazine 41 34-53 (1950).

Wilkins, J. J.
Betatron starting in high energy electron synchrotrons. Atomic Energy Research Establishment Report No. AERE-EL/R-331, May 3, 1949. 24 p.

Wilkinson, K. J. R.
A recent betatron development. BTH Activities 19, 417-24 (1948).

Cyclotrons

See also F.M. Cyclotrons. Articles concerning the 184-inch cyclotron at the University of California Radiation Laboratory are listed under F.M. Cyclotrons. See also (Electron Cyclotrons) Microtrons.

Abelson, P. H., and Kruger, P. G.
Cyclotron-induced radiation cataracts. Science 110, 655-57 (1949).

Baker, O. H.
Production of forgings for Carnegie Institute of Technology cyclotron. Industrial Heating 15, 1654-62 and 1844 (1948).

Baker, W. R.
The oscillator for the injector cyclotron of the quarter-scale bevatron. UCRL-457, Sept. 21, 1949. 10 p.

Bakker, C. J.
The Amsterdam cyclotron. Voordrachten gehouden voor het Koninklijk Instituut van Ingenieurs 2, 517-23 (1950). In Dutch.

Barnes, S. W., et al.
Construction report; 130-inch Rochester cyclotron; July 1946--July 1949. University of Rochester, July 1949. 95 p. NP-979.

Barnes, S. W., et al.
Note on the Rochester cyclotron. Physical Review 75, 983 (1949).

Bell, M. E., and Hull, G. F., Jr.
The cyclotron and proton synchrotron at the University of Birmingham. Office of Naval Research, London. Technical Report OANAR-27-50, Mar. 17, 1950. 10 p.

Creutz, E., et al.
Cyclotron magnet and oscillator design. Carnegie Institute of Technology. June 14, 1947. 23 p. NP-504.

Cross, W. G., et al.
The Harvard University 95-inch cyclotron. Design, construction, and preliminary operating instructions. Harvard University, July 1950. 358 p. AEC File No. NP-1698.

Curtis, B. R., Fowler, J. L., and Rosen, L.
Instrumentation for nuclear studies with externally focused deuteron beam from 10 Mev cyclotron. Review of Scientific Instruments 20, 388-93 (1949).

Davison, P. W., and Pollard, E. D.
Cyclotron bombardment of gaseous targets. Physical Review 72, 162 (1947).

Delano, Victor, and Goodman, Clark
Nuclear Shielding Studies. IV. Shielding properties of the concrete wall of the M.I.T. cyclotron. M.I.T. Laboratory for Nuclear Science and Engineering Technical Report No. 24, May 19, 1949. 116 p. NP-1244.

Delano, Victor, and Goodman, Clark
Shielding properties of the concrete wall of the M.I.T. cyclotron. Journal of Applied Physics 21, 1040-47 (1950).

Dickson, J. M., and Snowden, M.
Experiments on the 1/10 and 1/4 scale models of the Harwell cyclotron. Atomic Energy Research Establishment Report AERE-G/R-400, Sept. 1949. 17 p.

Dobbie, L. G.
Cyclotron; continuous wave fixed frequency excitation. Bibliography. Australia, Aug. 1948. 6 p. NP-1230.

English Electric Journal 11, 113-18 (1950)
Cyclotron power supplies.

Foss, Martyn H.
Design of cyclotron magnets. Carnegie Institute of Technology Department of Physics Technical Report No. 1. June 27, 1948. 154 p. NP-426.

Harvard University Nuclear Laboratory
The design and construction of a 92-inch cyclotron. In Progress Report Sept. 1--Nov. 15, 1947. 8 p. NP-107.

Lindström, Gunnar.
Some high frequency measurements on a cyclotron model. Arkiv för Matematik, Astronomi, och Fysik 35A, No. 15, Pt. 2 (1948). 10 p.

Lofgren, E. J.
A high intensity cyclotron. AECU-389. 1 p. Nuclear Science Abstracts 3, (1949), Abstract 1279 in entirety. /For use as injector for bevatron/

Mann, Wilfred B.
The cyclotron. 3rd ed. John Wiley & Sons, New York, 1950. 103 p.

Maslov, A. S.
Cyclotron. USSR Patent 69,550. Oct. 31, 1947.

MIT Nuclear Shielding Project. Bureau of Ships and Office of Naval Research.
Minutes of joint meeting of nuclear shielding project personnel and Navy representatives. AEC File No. NP-1455, Aug. 19, 1949. Pp. 9-18.

Moreno, T.
Resume of cyclotron project. MIT Research Laboratory of Electronics Technical Report No. 50. Oct. 30, 1947, 20 p. NP-140.

Nucleonics 7, No. 1, 72 (1950)
Recommendations for design of small cyclotrons. (From UCRL-476 by Louis Wouters)

Perlman, I.
The cyclotron in the atomic energy developments. MDDC-402, decl. Oct. 9, 1946. 11 p.

Pickavance, T. G., Adams, J. B., and Snowden, M.
The Harwell cyclotron. Nature 165, 90-91 (1950).

Rabinovich, M.
Phasing properties of the relativistic resonance accelerators. Part II. Cyclotron with varying frequency of dee voltage (Phasotron). Journal of Physics USSR 10, 523-32 (1946).

Reid, A. F. (to U.S. Atomic Energy Commission)
Cyclotron target. U.S. Patent 2,504,585, Apr. 18, 1950.

Rose, David
Design of cyclotron vacuum system. Carnegie Institute of Technology Technical Report No. 4. NP-883. 43 p.

Rotblat, J.
The cyclotron. Physics in Industry Series (Institute of Physics), Acceleration of Particles to High Energies 1950, 1-13.

Sagane, R., Yamamoto, N., and Imai, Y.
Preliminary experiments for the study of the nuclear reaction by using photographic plates. I. Homogeneity of the range of deuterons produced by the cyclotron. Bulletin of the Institute of Physical and Chemical Research (Tokyo) 22, 701-6 (1943).

Salisbury, Winfield W. (to Collins Radio Company, Cedar Rapids, Iowa)
Cyclotron oscillator system. U.S. Patent 2,492,324, Dec. 27, 1949.

Saunders, A. L.
An automatic operator for cyclotrons. University of Illinois Physics Department Technical Report No. 2, June 13, 1950. 34 p. NP-1714.

Siegel, Benjamin V., and Sinnott, Richard C.
The El Cerrito cyclotron. Physics Today 1, No. 4, 10-13, 26 (1948).

Sommer, H., and Thomas, H. A.
Detection of magnetic resonance by ion resonance absorption. Physical Review 78, 806 (1950). Letter.

Swiss Patent 244,180, March 17, 1948.
Cyclotron design.

Tape, G. F.
University of Illinois cyclotron oscillator. University of Illinois Technical Report No. 1, May, 1950. 47 p. AEC File No. NP-1582.

University of Chicago Institute for Nuclear Studies
Research program with the Chicago cyclotron; progress report, August 1, 1948 to August 1, 1949. n.d. 128 p. AEC File No. NP-1493.

Went, J. J.
Soft iron for the electromagnet of a cyclotron. Phillips Technical Review 10, 246-54 (1949).

White, M. G., et al.
Redesign of the Princeton cyclotron to yield 18 Mev protons. Physical Review 74, 1242-3 (1948).

Wouters, Louis
General recommendations for design of small cyclotrons. UCRL-476, Oct. 21, 1949. 15 p.

York, H., et al.
Acceleration of stripped light nuclei in the 60-inch cyclotron. MDDC-187. 3 p. (1946).

Electrostatic Generators

Cockcroft-Walton and Van de Graaff generators, Statitrons, et cetera.

Bame, S. J., Jr., and Baggett, L. M.
Voltage stabilization for electrostatic generators using an electron gun. In Progress Report, Oct. 1, 1948 to Sept. 30, 1949. Rice Institute, Sept. 30, 1949. AEC File No. NP-1387. Pp. 1-6.

Boag, J. W.
Electrostatic generators. Science Progress 37, 244-58 (1949).

Cooper, John N.
The Ohio State Van de Graaff generator. Ohio State University Research Foundation Technical Report 1, June 30, 1949. 33 p. NP-924.

Dobbie, L. G.
Electrostatic high voltage generators. Bibliography. Australia, Aug. 1948. 4 p. NP-1071.

Eurcham, W. E.
The one million volt accelerating equipment of the Cavendish Laboratory, Cambridge. Nature 160, 316-18 (1947).

Forsbergh, Peter W., Jr.
New type of electrostatic high-voltage generator. Office of Naval Research, London Branch. Technical Report No. ONRL-61-50, June 26, 1950. 4 p.

Fortescue, R. L., and Hall, P. D.
The high voltage electrostatic generator at the Atomic Energy Research Establishment. Proceedings of the Institution of Electrical Engineers 96 Part I, 77-85 (1949).

Green, G. W.
An electro-pneumatic vacuum valve. Journal of Scientific Instruments 26, 206 (1949).

Inglis, D. R., Krone, R. W., and Hanna, S. S.
A statitron for a small nuclear laboratory. Review of Scientific Instruments 20, 834-35 (1949).

Jennings, Burridge
Electronics and the electrostatic generator. Proceedings of the Institute of Radio Engineers 38, 1126-38 (1950).

Jennings, B.
Large straight through vacuum valve for Van de Graaff generators. Review of Scientific Instruments 20, 366-67 (1949).

Jeppson, M. R., and Turner, C. M.
A study of x-rays from the Berkeley Van de Graaff generator. AECU-214, Mar. 24, 1949. 9 p.

Lorrain, Paul
On the design of a radiofrequency Cockcroft-Walton accelerator. Review of Scientific Instruments 20, 216-17 (1949).

Los Alamos Laboratory
Van de Graaff photographs. MDDC-527, decl. Dec. 12, 1946. 16 p.

Lown, V. W.
The Van de Graaff generator. Electronic Engineering 21, No. 252, 45-47 and 61 (1949).

Machlett, R. R.
An accelerator column for two to six million volts. Proceedings of the National Electronics Conference 2 680-87 (1946).

McKibben, J. L., and Beauchamp, R. K.
Insulation flashover tests in vacuum and pressure. AECD-2039 (LADC-523) June 3, 1948. 28 p.

McKibben, J. L.
Plan of 12 Mev electrostatic accelerator under construction at Los Alamos. AECD-2038 (LADC-522) June 3, 1948. 16 p.

MIT Nuclear Shielding Project. Bureau of Ships and Office of Naval Research.
Minutes of joint meeting of nuclear shielding project personnel and Navy representatives. AEC File No. NP-1455, Aug. 19, 1949. /Electrostatic generator, pp. 19-32/

Ohlin, P., and Beckman, O.
An open Van de Graaff generator for 800 kv. Arkiv Fysik 1, Paper 14, 323-27 (1948). In Swedish.

Pennsylvania, University of
Annual report on nuclear research. June 30, 1950. 20 p. NP-1671.

Ranger, Richard H.
Electrostatic high voltage generators. Office of Military Government for Germany (U.S.) Field Information Agency Technical (Fiat) Final Report No. 894, Aug. 11, 1946. 15 p.

Sessions, W. P.
A four Mev Van de Graaff and 40 foot linear accelerator specifications. AECU-391, June 24, 1949. 11 p.

Shoupp, W. E.
The electrostatic generator used in nuclear studies. Electrical Engineering 67, 668-71 (1948).

Shoupp, W. E.
Precision studies of nuclear physics using the electrostatic generator. Proceedings of the National Electronics Conference 3, 385-94 (1947).

Turner, C. M., et al.
The Berkeley electrostatic generator. AECU-369, June 16, 1949. 34 p.

Turner, C. M., et al.
The Berkeley four million volt electrostatic generator. Physical Review 73, 534 (1948).

Turner, C. M.
Van de Graaff generator drawings. MDDC-1746. (1946). 12 p.

Van de Graaff, R. J., Trump, J. G., and Buechner, W. W.
Electrostatic generators for the acceleration of charged particles. Reports of the Physical Society on Progress in Physics 11, 1-8 (1946-47) (Pub. 1948).

F.M. Cyclotrons

See also Cyclotrons.

Adams, J. B., Randle, T. C., and Edmunds, A. O.
Magnetic measurements of the Harwell 110-inch synchrocyclotron. Atomic Energy Research Establishment. AERE-G/R-553, June 1950. 26 p.

Anderson, Herbert L., and Marshall, John.
The University of Chicago 170-inch synchrocyclotron. Progress report. University of Chicago Institute of Nuclear Studies. July 1947--July 1948. 166 p. NP-451.

Anderson, Herbert L., and Marshall, John.
The University of Chicago 170-inch synchrocyclotron; Progress report II; July 1948--July 1949. University of Chicago Institute of Nuclear Studies. n.d. 102 p. NP-1231.

Benson, W. K., et al.
Radiation field of the 184-inch cyclotron. Physical Review 75, 1470 (1949).

Burkig, J. W., Hubbard, E. L., and MacKenzie, K. R.
Pulsed oscillator for f.-m. cyclotron. Note in Review of Scientific Instruments 20, 135 (1949).

Debraine, Pierre, and Šimáně, Čestmir
Arrangement for the automatic synchronization of the cyclotron. Comptes Rendus de l'Academie des Sciences 226, 648-50 (1948).

Debraine, Pierre, and Šimáně, Čestmir
Arrangement for the automatic synchronization of the cyclotron. Journal de Physique et la Radium 9, 113-21 (1948).

Dodson, A.
184-inch cyclotron half-life measurements on dee. MDDC-1028. 2 p. (1947).

Edwards, R. F., and Owren, H. M.
Instruction notes for 184-inch cyclotron deflector high voltage pulse generator model IV (2L 7044), trigger amplifier (2L 6952), deflector regulator (2L 6974), regulator delay (2L 6932) and deflector power supply (3Z 1574). AECU-350, June 14, 1949. 19 p.

Foss, Martyn
Rotating condenser for synchro-cyclotron. Carnegie Institute of Technology Synchro-cyclotron Technical Report No. 5. Aug. 30, 1949. 13 p. NP-1101.

Gardner, Eugene, and Lattes, C. M. G.
Production of mesons by the 184-inch Berkeley cyclotron. Physical Review 74, 1236 (1948). I. Experimental arrangement.

Grauer, Carl T.
Survey of treated water supply system for the 184-inch [synchrocyclotron] area. AECU-253, Feb. 23, 1949. 13 p.

Henrich, L. R., Sewell, D. C., Vale, J.
Operation of the 184-inch cyclotron. AECU-354, May 17, 1949. 46 p.

Henrich, L R., Sewell, D. C., and Vale, J.
Operation of the 184-inch cyclotron. Review of Scientific Instruments 20, 887-98 (1949).

Kerns, Q. A., et al.
High voltage pulser for 184-inch cyclotron electric deflector. Review of Scientific Instruments 19, 899-904 (1948).

Kramer, H. P.
Summary of the Research Progress Meeting of Sept. 8, 1949. UCRL-463, Oct. 13, 1949. F. M. Cyclotron at Montreal, p. 3.

MacKenzie, K. R., et al.
Design of the radiofrequency system for the 184-inch cyclotron. AECD-2071 (UCRL-62); Review of Scientific Instruments 20, 126-33 (1949).

MacKenzie, K. R., and Waithman, V. B.
R.F. system for frequency modulated cyclotron. Review of Scientific Instruments 18, 900-907 (1947).

MacKenzie, K. R.
Wide range frequency modulation. Physical Review 74, 104-5 (1948). Letter.

Moyer, B. J., York, H. F., and Bjorklund, R.
High energy γ radiation from the 184-inch cyclotron target. Physical Review 75, 1470 (1949).

Panofsky, W. K. H., and Baker, W. R.
A focusing device for the external 350 Mev proton beam of the 184-inch cyclotron at Berkeley. Review of Scientific Instruments 21, 445-47 (1950).

Panofsky, W. K. H., and Baker, W. R.
A focusing device for the external 350 Mev proton beam of the 184-inch cyclotron at Berkeley. UCRL-499, Nov. 15, 1949. 12 p.

Panofsky, W. K. H., and Martinelli, Ernest A.
Magnetic deflector for mesons produced in the 184-inch cyclotron. Review of Scientific Instruments 20, 386-88 (1949).

Park, C. W.
184-inch cyclotron data. AECU-351, April 1, 1949. 17 p.

Powell, W. M., et al.
Electromagnetic deflector for the beam of the 184-inch cyclotron. Review of Scientific Instruments 19, 506-12 (1948); MDDC-1560.

Radiation Laboratory, Berkeley, California
Photographs of 184-inch cyclotron. MDDC-497, decl. Nov. 7, 1946. 6 p.

Williams, E. M., Johnson, L. W., and Collins, H. M.
Synchro-cyclotron Technical Report No. 6, 3/4 scale model oscillator report. Carnegie Institute of Technology. Aug. 1, 1950. 7 p. NP-1823.

Linear Accelerators

Alvarez, Luis, et al.
Berkeley proton linear accelerator. AECU-120 (UCRL-236) Nov. 30, 1948. 120 p.

Baker, W. R., Franck, J. V., and Gow, J. D.
Linear accelerator oscillator and coupling system. Physical Review 73, 535 (1948).

Bradner, Hugh, et al.
Physical design of the Berkeley linear accelerator. Physical Review 73, 534-35 (1948).

Brillouin, L.
Waves and electrons traveling together--a comparison between traveling wave tubes and linear accelerators. Physical Review 74, 90-92 (1948).

Clark, C. L.
Electron ballistics in the Yale linear accelerator. Physical Review 74, 1243 (1948).

Cockcroft, J.
The development of linear accelerators and synchrotrons for radiotherapy and for research in physics. Proceedings of the Institution of Electrical Engineers Pt. 1, 96, 296-303 (1949).

Fry, D. W., and Walkinshaw, W.
Linear accelerators. Reports of the Physical Society on Progress in Physics 12, 102-32 (1948-9).

Fry, D., et al.
A travelling-wave linear accelerator for 4 Mev electrons. Nature 162, 859-61 (1948).

Graffunder, W.
Development of the linear accelerator. Helvetica Physica Acta 22, 233-60 (1949).

Hoyaux, Max
On the possibility of accelerating electrified particles rectilinearly without energy limit. Academie Royale de Belgique, Bulletin de la Classe des Sciences, Mem. 36, 148-53 (1950). In French.

Knudsen, Hans Lottrup
On the electron dynamics in a one-stage linear accelerator with periodically varying field. Transactions of the Danish Academy of Technical Sciences 1949, No. 3, 54 p.

Lawton, Elliott J.
The choice of operating mode for standing-wave-type linear accelerators for electrons. Journal of Applied Physics 19, 534-39 (1948).

Lawton, Elliott H., and Hahn, W. C.
Experimental results on standing-wave-type linear accelerators for electrons. Journal of Applied Physics 19, 642-48 (1948).

Loach, B. G.
Vacuum equipment for the 4-Mev linear electron accelerator. Atomic Energy Research Establishment Report AERE-El-R-229, March 10, 1949. 51 p.

McCarthy, R. L., et al.
Two cavity operations of Yale linear electron accelerator. Physical Review 74, 1243 (1948).

McMillan, Edwin M.
Focusing in linear accelerators. UCRL-880, Aug. 24, 1950. 6 p.

Messiah, Albert
The dynamics of the electron in a linear accelerator. Comptes Rendus de l'Académie des Sciences 226, 1357-59 (1948).

Miller, B. L., and Wolf, J. M.
The acceleration of electrons by cylindrical cavities in TM_{01m} modes. Physical Review 73, 657 (1948).

Mullett, L. B., and Loach, B. G.
Experimental work on corrugated wave guides and associated components for linear electron accelerators. Proceedings of the Physical Society (London) 62, 271-84 (1948).

Mullett, L. B.
Two metre linear accelerator. Atomic Energy Research Establishment Report No. AERE-EL/R-385, Aug. 1949. 23 p.

Mullett, L. B., and Loach, B. G.
Waveguide bridge circuits for the combination of unequal powers with special reference to linear accelerator feed-back systems. Atomic Energy Research Establishment Report No. AERE-EL/R-391, Oct. 1949. 39 p.

Newberry, G. R.
The linear accelerator. Electronic Engineering 20, 346-47 (1948).

Newberry, G. R.
The microwave linear accelerator. British Journal of Radiology 22, 473-86 (1949).

Panofsky, W. K. H., Richman, Chaim, and Oppenheimer, Frank
Control of the field distribution in the linear accelerator cavity. Physical Review 73, 535 (1948).

Panofsky, Wolfgang K. H.
Proton linear accelerators. UCRL-696, May 5, 1950. 1 p. Nuclear Science Abstracts 4 (1950), Abstract 5309 in entirety.

Schiff, L. I.
Survey of possible experiments with linear electron accelerators. Stanford University Technical Report No. 102, Nov. 1949. 26 p. NP-1367.

Schultz, H. L., et al.
Preliminary studies of operation of the Yale linear electron accelerator. Physical Review 73, 1259 (1948).

Serber, Robert
Beam dynamics in the linear accelerator. Physical Review 73, 535 (1948).

Sessions, W. P.
A four Mev Van de Graaff and 40 foot linear accelerator specifications. AECU-391, June 24, 1949. 11 p.

Shersby-Harvie, R. B. R.-
A proposed new form of dielectric-loaded wave guide for linear electron accelerators. Nature 162, 890 (1948). Letter.

Shersby-Harvie, R. B. R.-
Travelling wave linear accelerator. Proceedings of the Physical Society (London) 61, 255-70 (1948).

Shersby-Harvie, R. B. R.-
Travelling wave linear accelerators - (Corrigendum). Proceedings of the Physical Society (London) 61, 571 (1948).

Shersby-Harvie, R. B. R.-, and Mullett, L. B.
A travelling wave linear accelerator with r.f. power feedback and an observation of r.f. absorption by gas in presence of a magnetic field. Letter in Proceedings of the Physical Society 62B, 270-71 (1949).

Shire, E. S.
Linear accelerators. Physics in Industry Series (Institute of Physics) Acceleration of Particles to High Energies 1950, 36-40.

Slater, J. C.
Design of linear accelerators. Reviews of Modern Physics 20, 473-518 (1948).

Stanford University Microwave Laboratory
Linear electron accelerator project; status report, Sept. 1--Nov. 30, 1949. 9 p. ML-109.

Stanford University Microwave Laboratory
Shielding plan for the Stanford linear accelerator. Feb. 1950. 11 p. AEC File No. NP-1443.

Terrall, J. R.
On the motion of particles in a traveling wave linear accelerator. Letter in Physical Review 77, 415-6 (1950).

Thomason, J. G.
A spectrometer for the 4-Mev linear accelerator. Atomic Energy Research Establishment Report No. AERE-G/R-217, Oct. 7, 1948. 20 p.

Walkinshaw, W.
Theoretical design of linear accelerator for electrons. Proceedings of the Physical Society (London) 61, 246-54 (1948).

Wiblin, E. R.
The traveling-wave linear accelerator. Science 112, 399-400 (1950).

Microtrons

(Electron Cyclotrons)

Henderson, W. J., and Redhead, P. A.
The electron cyclotron. Nucleonics 5, No. 4, 60 (1949)

Henderson, W. J., LeCaine, H., and Montalbetti, R.
Magnetic resonance accelerator for electrons. Nature 162, 699-700 (1948). Letter.

Redhead, P. A., LeCaine, H., and Henderson, W. J.
The electron cyclotron. Canadian Journal of Research A28, 73-91 (1950).

Proton Synchrotrons

Bevatrons, Cosmotrons, et cetera

Andreev, K.
Projected giant accelerators for obtaining particles with energies of 10^{10} ev. Uspekhi Fizicheskikh Nauk 38, 574-90 (1949). In Russian.

Baker, W. R.
The oscillator for the injector cyclotron of the quarter-scale bevatron. UCRL-457, Sept. 20, 1949. 10 p.

Bell, M. E., and Hull, G. F., Jr.
The cyclotron and proton synchrotron at the University of Birmingham. Office of Naval Research, London. Technical Report OANAR-27-50, March 17, 1950. 10 p.

Blewett, John P.
Induction accelerator for a proton synchrotron. Physical Review 73, 1258 (1948).

Blewett, M. Hildred
Effects of eddy currents on the field of the cosmotron magnet. Physical Review 75, 1288-9 (1949).

British Report M-4272, Nov. 12, 1948
Data on Birmingham proton synchrotron. 2 p.

Brobeck, W. M.
Design and construction of the bevatron quarter scale operating model. AECU-627 (UCRL-464), Aug. 22, 1949. 48 p.

Brobeck, W. M.
Design study for a ten Bev magnetic accelerator. Review of Scientific Instruments 19, 545-51 (1948); MDDC-1697.

Coor, T.
The Birmingham 1.3 Bev accelerator. Office of Naval Research (London Branch), June 14, 1949. 5 p. NP-999.

Farly, G. M.
University of California proton synchrotron (bevatron). AECU-326. 2 p. Nuclear Science Abstracts 3 (1949), Abstract 801 in entirety.

Garren, A. A., and Smith, Lloyd
Electron-optical properties of homogeneous magnetic and radial electric fields. UCRL-599, Feb. 8, 1950. 34 p.

Garren, A. A., et al.
Theoretical considerations in the design of a proton synchrotron. UCRL-547, Dec. 9, 1949. 38 p.

Gluckstern, R. L., and Smith, Lloyd
The injection of ions in the bevatron. Physical Review 75, 1467 (1949).

Green, G. K., Snyder, H. S., and Smith, L. W.
Dynamic magnetic measurements on cosmotron magnet model. Physical Review 75, 1289 (1949).

Green, G. K., Snyder, H. S., and Smith, L. W.
Dynamic magnetic measurements on cosmotron magnet model. AECU-263. 1 p.

Green, G. K.
Ion orbit control for a proton synchrotron. Physical Review 73, 1258 (1948).

Hibbard, L. U.
The Birmingham proton synchrotron. Nucleonics 7, No. 4, 97 (1950).

Hull, Gordon F., Jr.
Proposed new proton synchrotron. Office of Naval Research, London Branch. Technical Report No. OANAR-48-49, Dec. 28, 1949. 5 p.

Lawson, J. D.
Harmonic synchrotron for accelerating protons. Atomic Energy Research Establishment Report AERE-Memo-G/M-119, Feb. 1, 1949. 9 p.

Livingston, M. Stanley
Design study for a 10 Bev proton synchrotron. Physical Review 73, 1258 (1948).

Livingston, M. S., et al.
Design study for a 3 Bev proton accelerator. AECU-337. n.d. 50 p.

Livingston, M. S., et al.
Design study for a three Bev proton accelerator. Review of Scientific Instruments 21, No. 1, 7-22 (1950).

Lofgren, E. J.
A high intensity cyclotron. AECU-389. 1 p. Nuclear Science Abstracts 3 (1949), Abstract 1279 in entirety. [Injector for bevatron]

Lofgren, E. J.
Operation of 1/4 scale model bevatron. I. AECU-372, June 13, 1949. 10 p. II. AECU-435 (UCRL-398), July 13, 1949. 16 p. III. AECU-450 (UCRL-412), Aug. 1, 1949. 11 p. IV. UCRL-452, Sept. 8, 1949. V. UCRL-493, Oct. 25, 1949. 11 p.

Lofgren, E. J.
The proton synchrotron. UCRL-557, Dec. 27, 1949. 21 p.

Lofgren, E. J.
Proton synchrotron. Science 111, 295-300 (1950).

Moore, Wm. H., and Blewett, John P.
Magnetic circuit for a proton synchrotron. Physical Review 73, 1258 (1948).

Plotkin, Martin, and Blewett, John P.
Ferromagnetic ferrites for a cosmotron accelerating unit. Physical Review 75, 1288 (1949).

Pressman, A. I., and Blewett, J. P.
A 300 to 400-Kc electrically tuned oscillator. AECU-784, n.d. 19 p.

Riedel, Jack
Frequency control for the bevatron R-F voltage. UCRL-692, May 4, 1950. 2 p. Nuclear Science Abstracts 4, Abstract 4685 in entirety (1950).

Sewell, D.
The design of the bevatron magnet. UCRL-682, Apr. 27, 1950. 2 p. Nuclear Science Abstracts 4 (1950), Abstract 4684 in entirety.

Smith, Lloyd
Physical Considerations concerning the design of the bevatron. AECD-2200 (UCRL-129), June 21, 1948. 26 p.

Twiss, R. Q., and Frank, N. H.
Orbital stability in a proton synchrotron. Review of Scientific Instruments 20, 1-17 (1949).

White, M. G.
Design of the Brookhaven high energy proton synchrotron. Physical Review 75, 1288 (1949).

Yuan, Luke C. L.
Design of a wide-band radio-frequency power amplifier for a 2.5-Bev proton accelerator. AECU-896, n.d. 9 p.

Synchrotrons

Allen-Williams, D. J., and Appleyard, R. K.
Some calculations on the γ dose produced by a 14 Mev betasynchrotron using an internal target. Proceedings of the Cambridge Philosophical Society 45 (Part 2), 305-10 (1949).

Allen-Williams, D. J., and Appleyard, R. K.
Some experiments with a 14 Mev betasynchrotron. British Journal of Radiology 22, 106-9 (1949).

Atomics 6, No. 4, 23-25 (1950)
Seventy-million volt electron beam produced by synchrotron.

Blachman, Nelson M., and Courant, Ernest D.
Dynamics of a synchrotron with straight sections. Review of Scientific Instruments 20, 596-601 (1949).

Blachman, Nelson M., and Courant, Ernest D.
Scattering of particles by the gas in a synchrotron. Physical Review 74, 140-44 (1948).

Blachman, N. M., and Courant, E. D.
Correction and addendum: Scattering of particles by the gas in a synchrotron. Letter in Physical Review 75, 315 (1949).

Blachman, Nelson M.
Synchrotron-oscillation resonance. AECU-866, n.d. 1 p. Nuclear Science Abstracts 4 (1950), Abstract 5308 in entirety.

Cockcroft, J.
The development of linear accelerators and synchrotrons for radiotherapy and for research in physics. Proceedings of the Institution of Electrical Engineers Pt. 1, 96, 296-303 (1949).

Cornell University Floyd Newman Laboratory of Nuclear Studies
Synchrotron progress report. Nov. 1, 1949. 65 p. NP-1246.

Courant, E. D., and Bethe, H. A.
Electrostatic deflection of a betatron or synchrotron beam. Review of Scientific Instruments 19, 632-37 (1948).

Courant, E. D.
A resonance effect in the synchrotron. Journal of Applied Physics 20, 611-16 (1949); AECU-76 (BNL)

Davy, N.
A note on the shape of the pole pieces of a synchrotron magnet. Proceedings of the Physical Society (London) 60, 598-99 (1948).

Dazey, Mitchell H., et al.
The radiofrequency system of the Berkeley synchrotron. AECU-578 (UCRL-406) Aug. 4, 1949. 18 p.

Dazey, Mitchell
Resonators for the 300-Mev Berkeley synchrotron. UCRL-707, June 5, 1950. 61 p.

Dazey, Mitchell H., et al.
Synchrotron radiofrequency system. Review of Scientific Instruments 21 436-39 (1950).

dePackh, D. C., and Birnbaum, M.
Prebunching: A method controlling synchrotron radial oscillation amplitudes. Letter in Journal of Applied Physics 19, 795 (1948).

dePackh, D. C., and Birnbaum, M.
Theory of the capture process in a betatron-injected synchrotron. Review of Scientific Instruments 21, 451-56 (1950).

Dobbie, L. G.
Synchrotrons. Bibliography. Australia, Aug. 1948. 3 p. NP-1072.

Elder, F. R., Langmuir, R. V., and Pollock, H. C.
Radiation from electrons accelerated in a synchrotron. Physical Review 74, 52-56 (1948).

Elder, F. R., et al.
A 70 Mev synchrotron. General Electric Research Laboratory. 37 p. NP-1012. n.d.

Forecast, 10, 408 (1948)
Glasgow synchrotron.

Fry, D. W., et al.
The design and operation of a 30 Mev synchrotron. Institution of Electrical Engineers Paper No. 971 (1950). 15 p.

Fry, D. W.
The synchrotron accelerator--its potentialities as a generator of x-rays and electrons of 10-15 Mev energies for medical use. British Journal of Radiology 22, 462-72 (1949).

Gauer, Gervase, and Nunan, Craig
X-ray beam shaper for the Berkeley synchrotron. UCRL-714, May 23, 1950. 4 p. Nuclear Science Abstracts 4 (1950), Abstract 5310 in entirety.

General Electric Research Laboratory, Schenectady, N. Y.
300 Mev nonferromagnetic synchrotron. Quarterly Progress Report No. 6, Period ending March 1, 1948. Sept. 1, 1948. 103 p. NP-430.

Goward, F. K.
Betatron injection into synchrotrons. Proceedings of the Physical Society (London) 62A, 617-31 (1949).

Goward, F. K.
Betatron injection into synchrotrons. Atomic Energy Research Establishment Report No. AERE-G/R-191, Apr. 23, 1948. 33 p.

Goward, F. K.
Betatrons and synchrotrons. Physics in Industry Series (Institute of Physics), Acceleration of Particles to High Energies 1950, 14-28.

Goward, F. K., et al.
The design of electron synchrotrons. Institution of Electrical Engineers Paper No. 970 (1950). 14 p.

Goward, F. K.
Effect of azimuthal inhomogeneities in the magnetic field of a betatron or synchrotron. Proceedings of the Physical Society 61, 284-93 (1948).

Goward, F. K., et al.
Quarter-wavelength coaxial line resonators for betatron-started synchrotrons. Institution of Electrical Engineers Paper No. 875 (1949). 9 p. Proceedings of the Institution of Electrical Engineers 96, Pt. III, 508-16 (1949).

Goward, F. K., and Wilkins, J. J.
Validity of two-dimensional design of synchrotron pole pieces. Proceedings of the Physical Society (London) 61, 580-82 (1948).

Greenberg, J. Mayo, and Berlin, T. H.
Gas-scattering in the electron synchrotron. Physical Review 74, 1243 (1948).

Kaiser, T. R., and Tuck, J. L.
Air-cored synchrotron. Nature 162, 616-18 (1948).

Kaiser, T. R.
The capture of particles into synchrotron orbits. Proceedings of the Physical Society (London) 63A, 52-66 (1950).

Kaiser, T. R., and Tuch, J. L.
Experiments on electron capture and phase stability in a 14 Mev synchrotron. Proceedings of the Physical Society (London) 63A, 67-74 (1950).

Kramer, H. P.
Summary of the research progress meeting of Sept. 8, 1949. UCRL-463, Oct. 13, 1949. Synchrotron experiments, pp. 3-7.

Lafferty, J. M., and Pollock, H. C.
Electron guns for an 80 Mev synchrotron. AECU-547 (RL-248), Aug. 1949. 23 p.

Lawson, J. D.
The angular distribution of synchrotron target radiation: a preliminary experimental study. Proceedings of the Physical Society (London) 63, 653-60 (1950).

Lawson, J. D.
Double orbit in the 30 Mev synchrotron. Letter in Nature 165, 109-10 (1950).

Lawson, J. D., Walford, H. E., and Aram, J. H.
Extraction of the electron beam from a 30 Mev synchrotron. Letter in Nature 166, 234-5 (1950).

Lees, D. J., and Metcalfe, L. H.
Measurement of polar diagram of synchrotron gamma radiation. Proceedings of the Physical Society (London) 63, 661 (1950). Letter.

Liben, William.
Pressure gradient in a synchrotron vacuum tube. AECU-894, n.d. 2 p.

Martin, J. H.
Hospital synchrotron. Electrical Review, London, 165, 277-79 (1949).

Martin, Marvin
Operation of the Berkeley synchrotron. UCRL-648, Mar. 29, 1950. 1 p. Nuclear Science Abstracts 4 (1950), Abstract 4683 in entirety.

National Bureau of Standards (U.S.) Technical News Bulletin 34, 112-15 (1950)
Radiation physics at the National Bureau of Standards.

Nature 164, 726-28 (1949)
A 30 million volt synchrotron for medical use.

Nunan, Craig Spencer
Radio frequency accelerating system for the 300 Mev synchrotron. AECU-341, Mar. 26, 1949. 121 p.

Oppermann, Richard H.
70 million volt synchrotron. Journal of the Franklin Institute 246, 441-42 (1948).

Rabinovich, M.
Phasing properties of the relativistic resonance accelerators. Part I. Synchrotron. Journal of Physics USSR 10, 523-32 (1946).

Robinson, C.
Three dimensional design of synchrotron pole pieces. Proceedings of the Physical Society (London) 62A, 592-97 (1949).

Salsig, W. W.
First large synchrotron placed in operation. AECU-219, Feb. 23, 1949. 6 p.

Touschek, B. F.
The synchrotron. Acta Physica Austriaca 3, 146-55 (1949). In German.

Wideroe, R.
A new method for displacing the electron beam in a betatron (synchrotron). Note in Review of Scientific Instruments 19, 401-2 (1948).

Wilkins, J. J.
Betatron-starting in electron synchrotrons. Philosophical Magazine 41, 34-53 (1950).

Wilkins, J. J.
Betatron starting in high energy electron synchrotrons. Atomic Energy Research Establishment Report No. AERE-EL/R-331, May 3, 1949. 24 p.

Wilkins, J. J.
Validity of two dimensional design of synchrotron pole-faces. Proceedings of the Physical Society (London) 63A, 177-78 (1950).

Ion Sources

Allison, Samuel K.
Construction and performance of a low voltage arc as a source of positive ions. Review of Scientific Instruments 19, 291-98 (1948).

Atterling, Hugo
Experiments with an arc ion source for the cyclotron. Arkiv för Matematik, Astronomi, och Fysik 35A, No. 32, 16 p. (1948). In English.

Backus, John G. (to U.S. Atomic Energy Commission)
Ion generator. U.S. Patent 2,499,289, Feb. 28, 1950.

Bailey, Carl, Drukey, D. L., and Oppenheimer, F.
Magnetic ion source. Review of Scientific Instruments 20, 189-91 (1949).

Bayly, A. J., and Ward, A. G.
Positive ion source. Canadian Journal of Research 26A, 69-78 (1948).

Bohm, D., et al.
A study of the arc plasma. AECD-2094 (BP-39), July 9, 1948. 217 p.

Burcham, W. E.
The development of a source of fast neutrons of variable energy. Part I. High intensity of ion sources. NRC-1586 (MP-176) National Research Council of Canada, Atomic Energy Research Division Report, Sept. 13, 1945. 30 p.

Burcham, W. E., Paul, E. B., and Jelley, J. V.
The development of a source of fast neutrons of variable energy. Part II. The Ottawa high tension set. NRC-1587 (MP-178) National Research Council of Canada, Atomic Energy Research Division Report, Oct. 19, 1945. 22 p.

Cassignol, Ch.
Principle of an ion source for intense beams. Letter in Nature 166, 233-4 (1950).

Ewald, Heinz
Closely-regulating needle valves for ion sources. Zeitschrift für Naturforschung 5a, 230-31 (1950). In German.

Fillmore, Franklin, Hudgins, Arthur, and Jeppson, Morris
Ion source equipment for Berkeley electrostatic generator. Physical Review 73, 534 (1948).

Hall, R. N.
High frequency proton source. Review of Scientific Instruments 19, 905-10 (1948).

Hoyaux, Max, and Dujardin, Ignace
Comparative survey of ion guns. Nucleonics 4, No. 5, 7, and No 6, 12; and Nucleonics 5, No. 1, 67 (1949).

Jelley, J. V., and Paul, E. B.
A 600 kv ion accelerator. Canadian Journal of Research 26F, 419-25 (1948).

Keller, R.
Ion source of the Penning type. Helvetica Physica Acta 22, 78-88 (1949).

Keller, R.
New source of electrons and its inversion as a source of ions. Helvetica Physica Acta 21, 170-72 (1948). In French.

King, L. D. Percival (to U.S. Atomic Energy Commission)
Ion source. U.S. Patent No. 2,498,841, Feb. 28, 1950

Kistemaker, I. J., and Dekker, H. L. Douwes
Investigations on a magnetic ion source, I. Physica 16, 198-208 (1950); II. Physica 16, 209-20 (1950).

Loevinger, Robert (to U.S. Atomic Energy Commission)
Ion generator. U.S. Patent 2,499,320, Feb. 28, 1950.

Lorrain, P.
New source of electrons and its inversion as a source of ions. Helvetica Physica Acta 21, 497-98 (1948).

McKibben, J. L.
Focusing ion beams in high gradient tubes. AECD-2475 (LADC-604). Decl. Feb. 21, 1949. 7 p.

Mills, C. B., Barnett, C. F., and Livingston, R. S.
A hollow-anode ion source for the cyclotron. Y-542, Nov. 8, 1949. 16 p.

Murray, Raymond
Methods of study of arc discharges in uniform magnetic fields. Y-632, Aug. 11, 1950. 152 p.

Neuert, Hugo
Generation of ionic beams in a high frequency discharge. Zeitschrift für Naturforschung 3a, 310-12 (1948); Zeitschrift für Naturforschung 4a, 449-55 (1949).

Pachner, Jaroslav
Design of an improved-yield discharge tube. Nucleonics 3, No. 6, 43-51 (1948).

Robinson, Charles F.
Observations on some properties of ultra-high frequency gas discharges. Review of Scientific Instruments 21, 617-21 (1950).

Rutherglen, J. G., and Cole, J. F.
Radiofrequency ion source with high percentage yield of protons. Nature 160, 545-46 (1947).

Setlow, Richard B.
High-current ion source. Review of Scientific Instruments 20, 558-60 (1949).

Stone, Albert M.
Report on British ion sources. Office of Naval Research London Branch Report OANAR-48-47. Dec. 10, 1947. NP-707. 17 p.

Thonemann, P. C., et al.
The performance of a new radio-frequency ion source. Proceedings of the Physical Society (London) 61, 483-85 (1948).

Wiedenbeck, M. L.
Positive ion gun for the Notre Dame Van de Graaff-Herb generator. AECD-2045 (ANL-HDY-463), 1945. 5 p.

Whitby, H., and Snowden. M.
A modulator for a cyclotron ion source. Atomic Energy Research Establishment Report AERE-G/R-307, Feb. 1949. 18 p.

Woodyard, John R.
R.F. power supply for a 500-kv ion source. UCRL-694, May 5, 1950. 2 p. Nuclear Science Abstracts 4 (1950), Abstract 4687 in entirety.

Zilverschoon, C. J.
Amsterdam conference on ion sources. Nature 165, 309-10 (1950).

Miscellaneous

Allan, D. L. et al.
The recovery of tritium used in ion accelerators. Atomic Energy Research Establishment. AERE-N/R-494, Mar. 1950. 8 p.

Allison, S. K., et al.
Construction and calibration of a cylindrical electrostatic analyzer. Review of Scientific Instruments 20, 735-44 (1949).

Altar, W., and Garbuny, M.
Absolute speed gauge for high voltage particles. Physical Review 76 496-501 (1949).

Baker, Charles P. (to U.S. Atomic Energy Commission)
Method and apparatus for control of beam energy. U.S. Patent 2,485,470, Oct. 18, 1949.

Baker, W. R., et al.
High voltage pulse transformer designs at the University of California Radiation Laboratory. AECU-304, May 20, 1949. 39 p.

Blewett, J. P.
Radio frequency problems associated with particle accelerators. AECU-752, n.d. 1 p. Nuclear Science Abstracts 4 (1950), Abstract 3813 in entirety.

Bunemann, O.
Phase stability in particle accelerators. Report on the International Conference "Fundamental particles" (1946) Physics Society (London) 1, 129-32.

Carlson, Gösta, and Bartholdson, I.
A 200-kv neutron generator. I. and II. Arkiv Fhysik 2, 277-93 (1950). In English.

Cockcroft, J. D., Duckworth, J. C., and Merrison, A. W.
High energy electron accelerators as pulsed neutron sources. Letter in Nature 163, 869 (1949).

Dällenbach, W.
Phase-focusing in linear accelerators and in spiral accelerators. Annalen der Physik, Leipzig (Folge 6) 3, 89-100 (1948). In German.

Gund, K., and Reich, H.
Extraction of an electron beam from an electron accelerator. Zeitschrift für Physik 126, 383-98 (1949).

Harris, C. H.
Radiation Laboratory magnet regulators, service and operation. UCRL-520, Nov. 14, 1949. 29 p.

Jones, W. B., et al.
A new method for particle injection into accelerators. Physical Review 78, 60-62 (1950).

Kerst, Donald, and Serber, Robert (to Board of Trustees of the University of Illinois, Urbana, Illinois)
Magnetic induction accelerator with small x-ray sources. Canadian Patent 462,135, Dec. 27, 1949.

Lopukhin, V. M., and Ugarov, V. A.
Electromagnetic radiation in accelerators. Uspekhi Fizicheskikh Nauk 34, 398-414 (1948). In Russian.

McDaniel, B. D., Lavatelli, L. S., and Graves, E.
Modulation and other tendencies used with ion accelerators. In AECD-2287 (LADC-516), Dec. 15, 1947. Pp. 1-84.

McKibben, J. L.
Focusing ion beams in high gradient tubes. AECD-2475 (LADC-604), decl. Feb. 21, 1949. 7 p.

Mellen, G. E., et al.
Design of an equipotential tray. Y-530, July 29, 1948. 15 p.

Mjakishev, G. Y.
Theory of electron beam high frequency generators. Journal of Technical Physics USSR 18, 1063-68 (Aug. 1948). In Russian.

Motz, H.
Applications of radiation from fast electron beams. Stanford University Microwave Laboratory, July, 1950. 39 p. AEC File No. NP-1692.

Murray, Raymond
Methods of study of arc discharges in uniform magnetic fields. Y-632, Aug. 11, 1950. 152 p.

Oliphant, M. L.
The cyclosynchrotron. Nature 165, 466-68 (1950).

Pallock, Herbert C., and Westendorp, Willem F. (to General Electric Co., Schenectady, N. Y.)
Imparting high energy to charged particles. U.S. Patent 2,485,409, Oct. 18, 1949.

Richardson, R. E., and Sewell, Duane C.
A device for determining the direction of flux lines in the time varying magnetic field of a particle accelerator. AECU-656 (UCRL-488), Oct. 25, 1949. 6 p.

Svartholm, Nils
The resolving power of a ring-shaped inhomogeneous magnetic field for the two directional focusing of charged particles. Arkiv för Matematik, Astronomi, och Fysik 33A, No. 24 (1946). 10 p. In English.

Westcott, C. H.
A study of expected loss rates in the counting of particles from pulsed sources. Proceedings of the Royal Society 194A, 508-26 (1948).

Westendorp, W. F. (to General Electric Co., Schenectady, N. Y.)
Accelerator magnet structure. U.S. Patent 2,491,345, Dec. 13, 1949.

PARTICLE ACCELERATORS IN THE UNITED STATES

Location	Type	Dimensions	Energy (Mev)	Particle
Argonne National Laboratory	*Constant frequency cyclotron	60" pole piece dia.	20	d
	Van de Graaff		1.5	e
	Van de Graaff	Tank 7' dia. x 25'long 15' accelerating tube	3.5	p, d, etc.
Bartol Research Foundation	Van de Graaff	5' accelerating tube Tank 4' dia. x 12' long, 200 lbs. pressure	1.8	p, d
	*Van de Graaff	21' accelerating tube Tank 12' dia. x 35' long, 300 lbs. pressure	5-10	p, d
	Linear Accelerator *Additional section under construction	1.75' long	1.4	e
Biochemical Research Foundation (Newark, Delaware)	Cyclotron[1]	38" pole piece dia.	12	d

*Under construction

[1] Data from Goldsmith, H. H., List of High Energy Installations, Brookhaven National Laboratory, 1948.

Location	Type	Dimensions	Energy (Mev)	Particle
Brookhaven National Laboratory	Electrostatic accelerator	8' accelerating tube	2-3	d, p
	Electrostatic accelerator	12' accelerating tube	4	p, d
	*Cyclotron	60' pole piece dia.	20	p, d
	Electrostatic accelerator	3' accelerating tube	2	e
	*Proton synchrotron (Cosmotron)	30' orbit radius	2000-3000	p
University of California	Cyclotron (60")	72" pole piece dia.	9 18 36	p d α
	Synchrocyclotron	184" pole piece dia.	350 195 390	p d α
	Linear accelerator	40' long	32	p
	Van de Graaff	Tank 8' dia. x 27' long	4	p
	Synchrotron	1 meter orbit radius	335	e
	*Proton synchrotron (Bevatron)	ca 120' pole piece dia.	6440	p
University of California Medical School	*Synchrotron	11.5' orbit radius	70	e
University of California at Los Angeles	Cyclotron	37" pole piece dia.	15	p

Location	Type	Dimensions	Energy (Mev)	Particle
California Institute of Technology	Kevatron (Transformer-condenser rectified)	13" tube	0.135	p, d
	Electrostatic generator	5' x 6' tank, 27" tube	0.6	p, d
	Electrostatic generator	8'x 13' tank, 8'6" tube	1.7	p, d
	Electrostatic generator	8' x 22' tank, 9' tube	3	p, d
	*Synchrotron	138" radius	500	e
Carnegie Institute of Technology	*Synchrocyclotron	141.67" dia.	ca 440	p
Carnegie Institution	Cyclotron[1]	60" pole piece dia.	15	d
	Electrostatic generator[1]		1	p, d
	Electrostatic generator[1]		3.5	p, d
Case School of Applied Science	Flux-forced field-biased betatron	Radius 17.15 cm	30	e
	*Direct voltage accelerator	Length 8'	0.7	p
Catholic University of America	Electrostatic generator[1]		0.5	p, d
University of Chicago	Synchrocyclotron	170" dia.	500 450 250	α p d
	Cyclotron[1]	32.5" pole piece dia.	8	d
	Cockcroft-Walton[1] (being rebuilt)		0.4	p, d
	Betatron[1]		50-100	e

Location	Type	Dimensions	Energy (Mev)	Particle
Columbia University	Cyclotron	36" pole piece dia.	8-10	d
	Cyclotron (F.M.)	164" pole piece dia.	385	p
Cornell University	Synchrotron	1 m orbit radius	300	e
	Linear Accelerator[1]		0.5	
	Cyclotron[1]	15" pole piece dia.	1.5 1	d p
Duke University	*Van de Graaff	25' tank	4	p, d, α
El Cerrito High School, El Cerrito, California	Cyclotron	6" pole piece dia.	1	p
General Electric Company	6 betatrons	3 - 33" orbit radii 2 - 7.5" orbit radii 1 - 5.25" orbit radius	100 10 20	e e e
	*Cyclotron	60" pole piece dia.	20 40	d α
	4 Synchrotrons (2 under construction)	3 - 11.5" orbit radii 1 - 33" orbit radius	70 180	e e
	Van de Graaff	8'	2.5	p
Harvard University	Synchrocyclotron	95" pole piece dia.	125	p
Hofstra College	*Cyclotron	24" pole piece dia.	ca 6	p
University of Illinois	Cyclotron[1]	47" pole piece dia.	5 10	p d
	Betatron[1]		22	e
	Betatron[1]		4	e

Location	Type	Dimensions	Energy (Mev)	Particle
University of Illinois (cont.)	Betatron	26 cm orbit radius	80	e
	Betatron	120 cm orbit radius	340	e
University of Illinois Medical School	Betatron	19.5 cm orbit radius	25	e
Indiana University	Cyclotron	45" pole piece dia.	11.4 5.7 22.8	d p α
Iowa State College	Transformer-rectifier produced d.c. potential; linear accelerator tube	Tube length ca 60"long	0.325-0.650	p, d
	Synchrotron	11.5" orbit radius	70	e
University of Iowa	Pressurized Van de Graaff	22' accelerator tube	3-4.	p, d
	Voltage multiplier accelerator	5' accelerator tube	0.5	p, d
Johns Hopkins University	Van de Graaff	6' dia. x 14' long tank, accelerating tube 7' long	1.5	p, d
University of Kansas	Van de Graaff	Horizontal tank 6' dia. x 14' long, 120 psi pressure	2.5	positive ions
University of Kentucky	Pressurized Van de Graaff	Electrode dia. 48" Accelerating tube length 8'	1	p, d
Los Alamos Scientific Laboratory	Cyclotron	42" pole piece dia.	10	d
	Van de Graaff		2.5	
	*Van de Graaff		12	
	Betatron		20	e
	*Betatron		20	e

Location	Type	Dimensions	Energy (Mev)	Particle
Los Alamos Scientific Laboratory (cont.)	Betatron		14	e
	Cockcroft-Walton		0.280	
	Cockcroft-Walton		0.125	
Massachusetts Institute of Technology	Van de Graaff	2' tube, 2" equi-potential module	ca 0.800	p, d
	Standing wave linear electron accelerator	20' long Guide wave length 10.7 cm	18	e
	Standard cyclotron	42" pole face	15 7.5 30	d p α
	Synchrotron	1 m orbit radius	340	e
	Vertical electrostatic generator, pressurized	9' accelerating tube	4	positive ions
	*Van de Graaff	Tank 12' dia. x 32' high 400 psi pressure	2-12	p, d, e
	Van de Graaff	Tank 4.5' dia. x 13' high 200 psi pressure	3.5	e
	2 Van de Graaff x-ray generators	Tanks 3' dia. x 6' high 400 psi pressure	2	e
University of Michigan	*Racetrack synchrotron	40" orbit radius	300	e
	Cyclotron	42" pole piece dia.	10	d
University of Minnesota	*Proton linear accelerator	100' long linear acceleration path	66	p
	Van de Graaff	18' dia., 100 psi tank, single electrode	4	singly charged ions

Location	Type	Dimensions	Energy (Mev)	Particle
University of Missouri	Van de Graaff (for demonstration purposes)		0.5	
National Bureau of Standards	Electrostatic[1]		1.4	e, p
	*Synchrotron	33" orbit radius	180	e
	Betatron		50	e
Naval Ordnance Laboratory	Betatron	5.5" orbit radius	10	e
Naval Research Laboratory	Betatron[1]		4	e
	Betatron	18.5 cm orbit radius	20-22	e
	*Synchrotron	77 cm orbit radius	10 (now)	e
	Cockcroft-Walton - half-wave quadrupler	Accelerator tube 39.25" long	0.075-0.250	p, d, α
	*High pressure horizontal Van de Graaff	Accelerating tube 175" long	5	p, d, α
	Van de Graaff		2.25	p, d
Northwestern University	*Vertical Van de Graaff, pressurized	12' accelerating path	4.5	p, d, α
University of Notre Dame	Pressure electrostatic generator, horizontal	40' long x 8' dia. tank	3	e
	Pressure electrostatic generator, horizontal	6' long x 3' dia. tank	2	e
Oak Ridge National Laboratory	Van de Graaff	12' accelerator tube	5.7	p, d
	Van de Graaff	5' accelerator tube	2.7	p, d, and heavier particles

Location	Type	Dimensions	Energy (Mev)	Particle
Oak Ridge National Laboratory (cont.)	Cockcroft-Walton	4' accelerator tube	0.400	positive ions
	Cyclotron	44" pole piece dia.	2	p
	Cyclotron	86" pole piece dia.	>20	p
Ohio State University	Betatron[1]		4	e
	Horizontal Van de Graaff	5' dia. x 20' long tank Accelerator tube 12' long	2	p, d
	Cyclotron	42" pole piece dia.	8.5 10 6.5 20 26	p d $_1H^3$ α $_2He^3$
University of Pennsylvania	Statitron[1] (electrostatic generator)		2-3	p
	Betatron[1]		22-25	
Picatinny Arsenal	Betatron	7.5" orbit radius	22	e
University of Pittsburgh	Cyclotron	47" pole piece dia.	8.5 16 32	p d α
Princeton University	Frequency modulated cyclotron	33" pole piece dia.	18	p
Purdue University	Microwave linear electron accelerator	3' long	1.5	e
	Cyclotron	37.5" pole piece dia.	20 10	α d

Location	Type	Dimensions	Energy (Mev)	Particle
Purdue Univeristy (cont.)	Synchrotron	40" orbit radius	300	e
	*Microwave linear electron accelerator	12' long	4-8	e
Rice Institute	Van de Graaff, horizontal pressure tank	14' vacuum tube	2.5	p, d
University of Rochester	Cyclotron[1]	26" pole piece dia.	7	p
	Synchrocyclotron	130" pole piece dia.	250	p
Rock Island Arsenal	Betatron	ca 15" orbit dia.	22	e
Stanford University	Cyclotron	27.75" pole dia.	2.9	d
	Linear electron accelerator (traveling-wave type)	14'5" long	6	e
	Linear accelerator - Mark II	12' long	35	e
	*Linear accelerator - Mark III	220' long (80' now operating)	1,000 (200 now)	e
University of Texas	*Van de Graaff	Accelerating tube 10' long	4-5	positive ions
	Cockcroft-Walton		0.100	p, d
University of Washington (Seattle)	*Cyclotron	60" pole piece dia.		positive ions
Washington University (St. Louis)	Cyclotron	45" pole face dia.	10 5	d p
Westinghouse Electric Co.	Electrostatic generator	30' accelerating tube 65 psi pressure	3.7	p, d

Location	Type	Dimensions	Energy (Mev)	Particle
University of Wisconsin	2 electrostatic generators (one under construction)		4.5	p, d, α
Yale University	Linear electron accelerator	4' 10.5" long	10-15	e
	Cyclotron	28" pole piece dia.	8 4	α d
University of Virginia	Van de Graaff (atomispheric)	5' column	0.4	positive ions
	Resonant cavity linear accelerator	1' length	1	e

PARTICLE ACCELERATORS OUTSIDE THE UNITED STATES

Location	Type	Dimensions	Energy (Mev)	Particle
Australia				
Australian National University, Canberra	*Cyclo-synchrotron	Pole tip diameter 136" Synchrotron orbit 117"	Cyclotron section 200 Then synchrotron action to 2000	p
University of Melbourne	Synchrotron	Orbit radius 7.5 cm	20	e
	Electrostatic generator	Length of accelerating tube 9'	1	p, d
	Electrostatic generator	Length of accelerating tube 6'6"	0.8	p, d
Canada				
McGill University	Synchrocyclotron	82" pole piece dia.	100	p
National Research Council Laboratories, Ottawa	Cockcroft-Walton		0.65	positive ions
National Research Council of Canada, Chalk River	Vertical Van de Graaff	Length of accelerating tube 9' 200 psi, tank 16' high x 6' dia.	5	positive ions
	Positive ion accelerator		0.2	positive ions
Queens University, Kingston, Ont.	Synchrotron	Orbit radius ca 30 cm	75-80	e
University of Saskatchewan	Betatron	Orbit radius 20 cm	27.5	e

Location	Type	Dimensions	Energy (Mev)	Particle
Denmark				
Institute of Theoretical Physics, Copenhagen	Cyclotron[1]	36" pole piece dia.	9.5	d
	Two electrostatic generators[1]		1	p
France				
Collège de France, Paris	Cyclotron[1]	31" pole piece dia.	7.5	d
Commissariat à l'Energie Atomique, Laboratoires du Fort de Chatillon, Fortenay-aux-Roses, Seine, France	*Cyclotron	162 cm pole piece dia.	26	d
	*Van de Graaff	Column length above base plate 5.85 m	3.5-4	p, d
	*Resonant cavity accelerator	Cavity dia. 92 cm Accelerating gap 3 cm	0.5	p
Laboratoire de Synthese Atomique, Ivry (Seine)	Electrostatic[1]		0.8	
	Electrostatic[1]		0.6	
	Electrostatic[1]		3	
University of Strasbourg	Cockcroft-Walton	Length 6 m	1.5	p, d
Germany				
Physikalisches Institut der Universität Bonn	Van de Graaff	Length 1.4 m	0.5	p, d
	Cyclotron[1]	16" pole piece dia.	2	p
University of Danzig	Electrostatic[1]		0.8	e

Location	Type	Dimensions	Energy (Mev)	Particle
Institut für Physik im Max-Planck-Institut für Med. Forschung der Universität Heidelberg	Cyclotron	101 cm (40") pole piece dia.	13	d
	Van de Graaff	Length 3.60 m (12')	1	p, d, e
Leipzig University	Cyclotron[1]	40" pole piece dia.		
Megavolt Versuchsanstalt, Wrist	Betatron[1]		15	e
University of Rostock	Electrostatic[1]		0.9	e
Siemens-Reiniger-Werke, Erlangen	Betatron	Radius of equilibrium 85 mm	6	e
	*Betatron	Radius of equilibrium 105 mm	12-15	e
Great Britain				
Associated Electrical Industries, Ltd., Aldermaston	Van de Graaff	Overall length 66"	0.5	p, d
	Van de Graaff	Pressure vessel height 18'6", dia. 6'10.5" 400 psi, tube length 9'	3.1	p d, α
Atomic Energy Research Establishment, Harwell	Synchrocyclotron	110" pole piece dia.	175	p
	Van de Graaff	Stack length 9'	2.7	p, d, α
	Van de Graaff	Tank 8' x 4', accelerating tube 5" dia., 350 psi	2.3	e
	*Cockcroft-Walton	Accelerating tube 6' long	0.6	positive ions
	Travelling-wave linear accelerator (non-feedback type)	Accelerating waveguide 2 m long	3.6	e

Location	Type	Dimensions	Energy (Mev)	Particle
Harwell, (cont.)	*Travelling-wave linear accelerator (2 stage feedback type)	Each section 3 m long, total 6 m	15	e
	*Cockcroft-Walton (Machine for Medical Research Council's Radio-biological unit at Harwell	Pressure tank ca 3 m high x 2 m dia.	1	positive ions (d)
University of Birmingham	Fixed frequency cyclotron	61.5" pole piece dia.	9 18 36	p d α
	*Proton synchrotron	15' pole piece dia.	1,300	p
Cambridge University	Van de Graaff[1]		4-5	p
	Cyclotron[1]	37" pole piece dia.	7	d
	Phillips[1]		1	p, d
	Phillips[1]		2	p, d
University of Edinburgh	*Cockcroft-Walton		1	p, d
Glasgow University	*Synchrotron	Orbit radius 125 cm	300	e
	Synchrotron	Orbit radius 10 cm	30	e
Imperial College of Science and Technology, London University	Pressurized electrostatic generator		ca 2	positive ions and e
University of Liverpool	*Synchrocyclotron	150" pole piece dia.	400	p d, α
	Cyclotron[1]	36" pole piece dia.	9	d

Location	Type	Dimensions	Energy (Mev)	Particle
Medical Research Council, Hammersmith Hospital, London	Van de Graaff	Accelerating tube 7'6" long x 10" dia., 10 atm. pressure	2	p, d, e, etc
	*Linear accelerator	Corrugated wave guide 3 m long	8-10	e
	*Continuous wave cyclotron	45" pole piece dia.	15 30	d α
Metropolitan-Vickers, Ltd. High Voltage Laboratory, Manchester	Betatron[1]		20	e
	Betatron[1]		30	e
Oxford University	*Synchrotron	Orbit radius 46.7 cm	140	e
	Betatron	Orbit radius 20 cm	16	e
Royal Cancer Hospital, London	Synchrotron	Orbit radius 10 cm	30	e
Telecommunications Research Establishment (A.E.R.E. Section), Malvern Great	Dielectric loaded travelling wave linear accelerator without feedback	Length ca 90 cm	1.5	e
	Synchrotron[1]		15	e
	Synchrotron[1]		30	e
<u>Italy</u>				
Istituto Superiore di Sanità, Rome	Cockcroft-Walton	Length of accelerator tube ca 3.5 m	1	positive ions
University of Padua	Electrostatic[1]		1	p, d
<u>Netherlands</u>				
Institute for Nuclear Research, Amsterdam	Synchrocyclotron	71" pole piece dia.	28 56	d α

Location	Type	Dimensions	Energy (Mev)	Particle
Philips Corp., Eindhoven	Electrostatic[1]		1	p, d
University of Groningen	Electrostatic[1]		0.3	d
Norway				
Municipal Hospital, Bergen	Electrostatic[1]		1.5	e
	*Electrostatic[1]		1.5	p
	*Synchrotron[1]		70-80	e
Norges Tekniske Høgskole, Trondheim	*Van de Graaff	Tank 6.6 m long x 2.35 m dia. 15 atm. pressure, accelerating tube 3.6 m	4	p, d
University of Oslo	Neutron generator	Length 50 cm	0.1	d
	Van de Graaff	Length 1.5 m	0.5	p
	*Pressure insulated Van de Graaff	Length 3.6 m	4	p, d
Russia				
Radium Institute, USSR Academy of Sciences, Leningrad	Cyclotron[1]	14" pole piece dia.	1.8	d
Physico-technical Institute, USSR Academy of Sciences, Leningrad	Electrostatic[1]		0.7	p
Physico-technical Institute Ukrainian SSR Academy of Sciences, Kharkov	Electrostatic[1]		1	
	Electrostatic[1]		3	
	Electrostatic[1]		5	

Location	Type	Dimensions	Energy (Mev)	Particle
Sweden				
National Defense Research Laboratory, Stockholm	Electrostatic generator Pressure insulated (9 atm N_2)	Height of accelerating tube 2.25 m	1.8	p, d
Nobel Institute for Physics, Stockholm	Cyclotron	32" pole piece dia.	7	d
	*Cyclotron	88.5" (225 cm) pole piece dia.	25 50	d α
	Cascade generator		1.5	
Royal Institute of Technology, Stockholm	Synchrotron	Orbit radius 20 cm	35	e
	Betatron	Orbit radius 8.3 cm	5.3	e
University of Stockholm	Two electrostatic generators[1]			
University of Uppsala	*Synchrocyclotron	230 cm pole face dia	200	p
Switzerland				
Universität Basel	Cascade generator		1	p, d
Eidgenössische Technische Hochschule, Zürich	Van de Graaff	Length 3 m	1	p
	Tensator (Transformer-rectifier)	Length 6 m	2	d
	Cyclotron	1 m pole piece dia.	8 14	p d

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