

CYCLOTRONS 1975

The following list of cyclotrons is an excerpt of a detailed report which was compiled by F.T. Howard from Oak Ridge for the 7th International Cyclotron Conference in Zürich. It lists 74 facilities with isochronous (AVF) and 14 facilities with frequency modulated (FM) cyclotrons. At least 18 countries now have cyclotron projects in operation or in progress.

The detailed cyclotron list may be obtained from:

Accelerator Information Center, Physics Division
ORNL, Oak Ridge, TN 37830, USA.

List of Isochronous Cyclotrons

<u>Location</u>	<u>Descriptors</u>	<u>First Beam</u>
<u>Australia</u>		
1) Canberra, ANU	26 MeV H ⁻ injector (CNI-22)	1972
<u>Belgium</u>		
2) Louvain-la-Neuve, UCL	95 MeV p etc; 4-sec; (CSF)	1972
2+) Liege, UL	(20) MeV p etc; 4-sec; (CGR-MeV)	(1975)
<u>Brazil</u>		
3) Rio de Janeiro, IEN	24 MeV p etc; 3-sec; (CV-28)	1974
4) Sao Paulo, IEA	24 MeV p etc; 3-sec; (CV-28)	(1976)
<u>Canada</u>		
5) Vancouver, TRIUMF	520 MeV H ⁻ ; 6-sec; Meson Factory	1974
6) Winnipeg, UM	48 MeV H [±] ; 4-sec	1964
<u>Chile</u>		
7) Santiago, UC	10 MeV p etc; 3-sec; Davis Conv	1967
<u>France</u>		
8) Grenoble, ISN	58 MeV p etc; 4-sec	1967
9) Orleans, CNRS	33 MeV p etc; 4-sec (CGR-MeV)	1974
10) Orsay, AEC-Biol	(24) MeV p etc; 4-sec (CGR-MeV)	(1975)
11) Orsay, IPN	Heavy ions; 3-sec; ALICE-CEVIL	1965
12) Saclay, CEN	20 MeV ³ He ⁺⁺ ; 3-sec (Philips)	1964
<u>Finland</u>		
13) Jyväskylä, UJ	20 MeV p etc; 4 sec; MC-20	1974
<u>Germany, West</u>		
14) Berlin, HMIK	120 MeV p etc; with VdG inj; VIKSI	(1975/6)
15) Bonn, UB	30 MeV d etc; 3-sec	1968
16) Braunschweig, PTB	28 MeV p etc; 3-sec (CV-28)	(1974)
17) Essen, KGE	M-P, Medical Use (CV-28)	(1975)
18) Hamburg, UH	30 MeV p etc; 3-sec; HAIZY	1968
19) Jülich, IFK-KFA	45 MeV p etc; 3-sec; JULIC	1968
20) Jülich, IFF-KFA	24 MeV p etc; 3-sec (CV-28)	1975
21) Karlsruhe, KFK	26 MeV p etc; 3-sec (AEG)	1962
<u>India</u>		
22) Calcutta, BARC	60 MeV p etc; 3-sec	(1974)
<u>Italy</u>		
23) Milan, UM	45 MeV H ⁺ ; 3-sec	1965

List of Isochronous Cyclotrons (continued)

<u>Location</u>	<u>Descriptors</u>	<u>First Beam</u>
<u>Japan</u>		
24) Chiba, NIRS	70 MeV p etc; 4-sec; (CGR-MeV)	1973
25) Osaka, RCNP	(75) MeV p etc; 3-sec	1974
26) Sendai, TU	(40) MeV p etc; 4-sec; (CGR-MeV)	(1976)
27) Tokyo, IMS	26 MeV p etc; 3-sec; (CS-30)	1973
28) Tokyo, INS	28 MeV p etc; 3-sec	1974
<u>Netherlands</u>		
29) Amsterdam, VU	30 MeV p etc; 3-sec (Philips)	1965
30) Delft, TUD	12 MeV p; 4-sec (1st AVF to operate)	1957
31) Eindhoven, EUT	20 MeV p etc; 3-sec (Philips)	1963
32) Groningen, UG	70 MeV p etc; 3-sec; (Philips)	1970
33) Petten, Philips	30 MeV p etc; 3-sec; (Philips)	1964
<u>Sweden</u>		
34) Uppsala, AB Scan.	(30) MeV p etc; 4-s; (Scand.-MC-30)	(1975)
<u>Switzerland</u>		
35) Villigen, SIN	72 MeV p etc inj; 4-sec	1973
36) Villigen, SIN	590 MeV p; SIN; Meson Factory	1974
<u>United Kingdom</u>		
37) Amersham, RCL	27 MeV p; 3-sec	1965
38) Birmingham, UB	12 MeV d etc; 3-sec	1961
39) Edinburgh, MRC-WGH	15 MeV d, Medical (CS-30)	(1976)
40) Harwell, AERE	50 MeV p etc; 3-sec	1965
<u>United States</u>		
41) Brookhaven	36 MeV p etc; 3-sec	1968
42) Duke U	15 MeV H ⁻ inj; 3-sec (CN1-15)	1968
43) Indiana U	(225) MeV p etc; 4-sec	(1975)
44) Medi Physics, CA	22 MeV p etc; 3-sec (CS-22)	1970
45) Medi Physics, NJ	22 MeV p etc; 3-sec (CS-22)	1973
46) Michigan, SU	56 MeV p etc; 3-sec	1965
46a) same	400 (q ² /A) MeV Heavy ion, prototype	(1977)
47) Mt Sinai Med. C.	27 MeV p etc; 3-sec (CS-30)	1972
48) NASA-Lewis	46 MeV p; 3-sec	1972
49) Naval Res Lab	50 MeV p etc; 3-sec	1967
50) New Eng Nuc	22 MeV p etc; 3-sec	1970
51) Oak Ridge	67 MeV p etc; 3-sec; ORIC	1962
51a) same	300 q ² /A MeV; Heavy Ion SS Cyclotron	1981
52) Princeton U	50 MeV p etc; 3-sec	1968
53) Sloan-Kettering	15 MeV p etc; (CS-15)	1967
54) Texas A & M	50 MeV p etc; 3-sec; TAMVEC	1967
55) UC-Berkeley	60 MeV p etc; 3-sec	1961
56) UC-Davis	65 MeV p etc; 3-sec	1966
57) UC-Livermore	15 MeV H ⁻ inj; 3-sec (CN-15)	1969
58) UC-Los Angeles	50 MeV p; 4-sec (disassembled)	
59) UCLA-Med	22 MeV p etc; 3-sec (CS-22)	1971
60) U Chicago, Med	15 MeV p etc; 3-sec (CS-15)	1969
61) U Colorado	28 MeV p etc; 4-sec	1962
62) U Maryland	100 MeV p etc; 4-sec	1970
63) U Michigan	30 MeV p etc; 3-sec	1962
64) Washington U	30 MeV p etc; 3-sec	1965

List of Isochronous Cyclotrons (continued)

<u>Location</u>	<u>Descriptors</u>	<u>First Beam</u>
<u>USSR</u>		
65) Dubna, LNP-JINR	(41)MeV p etc; 4-sec; U-120 Conv	(1975)
66) Dubna, LNP-JINR	Ring Cyclotron; e-model; 8-sec	1967
67) Dubna, LNR-JINR	Heavy ions; U-200	1968
68) Dubna, LNR-JINR	Heavy ions; U-300	1960
69) Leningrad-RIEE	8 MeV Model for U-240	1963
70) Leningrad-RIEE	100 MeV p etc; 3-sec; U-240	1971
71) Moscow, FAIN	8- MeV p; Spectrometric	not planned
72) Moscow, IAE	100 MeV Heavy ion; U-240	Prop
73) Kharkov, KhFTI		
74) Kiev, IF	100 MeV p etc; 3-sec; U-240	

List of Frequency Modulated Cyclotrons

<u>Location</u>	<u>Descriptors</u>	<u>First Beam</u>
<u>Argentina</u>		
1) Buenos Aires	28 MeV d; standard FM	1954
<u>Canada</u>		
2) Montreal, McGill	100 MeV p; standard FM	1949
<u>CERN</u>		
3) Geneva	604 MeV p; standard FM (Conv)	1957 (74)
<u>France</u>		
4) Lyon, IPN	28 MeV d; standard FM	1963
5) Orsay, IPN	(200 + 170) MeV p etc;(modified FM)	1958(75)
<u>Germany, West</u>		
6) Göttingen, UG	27 MeV d; standard FM	1962
<u>Sweden</u>		
7) Uppsala, GWI	189 MeV p; standard FM	1951
<u>United Kingdom</u>		
8) Harwell, AERE	160 p etc; standard FM	1949
<u>United States</u>		
9) Columbia U	(570) p; 3-sec(FM Conv)	1950-(75)
10) Harvard U	160 p; standard FM	1949
11) NASA-SREL	590 p; standard FM	1965
12) UC-Berkeley	740 p etc; standard FM	1946-57
<u>USSR</u>		
13) Dubna, JINR	(700) p; 4-sec(FM Conv)	1949(78)
14) Gatchina, PTI	1000 p; standard FM	1967

List of International Cyclotron Conferences

<u>Place</u>	<u>Year</u>	<u>Organizer</u>	<u>Registered Participants</u>	<u>Cyclotron Projects Listed</u>	<u>Projects Operating</u>
1) Sea Island	1959	ORNL	85	14	2
2) LA, Calif.	1962	UCLA	139	41	11
3) Geneva	1963	CERN	146	42	15
4) Gatlinberg	1966	ORNL	224	61	27
5) Oxford	1969	AERE Harwell	202	72	45
6) Vancouver	1972	UBC	195	70+17 FM	
7) Zürich	1975	SIN	231	74+14 FM	49+17

References

- 1) Informal conference on sector-focused cyclotrons: Sea Island, GA, USA, 2-4 February 1959 [considered as the 1st Internat. Cyclotron Conf.]. Proceedings: F.T. Howard [ed.], National Academy of Sciences - National Research Council, Washington, DC; NAS-NRC Publ. 656 (1959), 303 pp.
- 2) International conference on sector-focused cyclotrons: Los Angeles, CA, USA, 17-20 April 1962 [considered as the 2nd Internat. Cyclotron Conf.]. Proceedings: K. Siegbahn and F.T. Howard [ed's.], Nuclear Instruments and Methods 18,19 (1962), 647 pp.
- 3) International conference on sector-focused cyclotrons and meson factories: CERN, Geneva, Switzerland, 23-26 April 1963 [considered as the 3rd Internat. Cyclotron Conf.]. Proceedings: F.T. Howard and N. Vogt-Nilsen [ed's.], CERN 63-19 (1963), 430 pp.
- 4) International conference on sector-focused cyclotrons: Gatlinburg, TN, USA, 2-5 May 1966 [considered as the 4th Internat. Cyclotron Conf.]. Proceedings: F. Howard [ed.], IEEE Transactions on Nuclear Science NS-13 (4), (1966) 531 pp.
- 5) 5th International cyclotron conference: Oxford, UK, 17-20 September 1969. Proceedings: R.W. McIlroy [ed.], Butterworth, London (1971), 807 pp.
- 6) 6th International cyclotron conference: Vancouver, B.C., Canada, 18-21 July 1972. Proceedings: "Cyclotrons - 1972", J.J. Burgerjon and A. Strathdee [ed's.], American Institute of Physics, New York, NY; AIP Conf. Proc. no. 9 (1972) 846 pp.
- 7) 7th International conference on cyclotrons and their applications: Zürich, Switzerland, 19-22 August 1975. Proceedings: W. Joho [ed.], Birkhäuser, Basel (1975), 656 pp.