

ENTRY NO. 1

NAME OF MACHINE CYCLOTRON, CGR-MeV, 520
INSTITUTION Institute for Nuclear Sciences - Rijksuniversiteit Gent
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IN CHARGE Prof. Dr. J. HOSTE (Director) REPORTED BY Dr. K. Strijckmans
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HISTORY AND STATUS

DESIGN, date 1974 Model tests
ENG DESIGN, date 1975
CONSTRUCTION, date 1976-77
FIRST BEAM, date (or goal) 1977
MAJOR ALTERATIONS 1981-82
(7 target stations; neutron therapy unit)
COST, ACCELERATOR
COST, FACILITY, total
FUNDED BY NFWO and RUG (1)

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 1 ENGINEERS 1
TECHNICIANS 3 CRAFTS 1
GRAD STUDENTS involved during year
OPERATED BY Research staff or 2 Operators
OPERATION 45 hr/wk. On target 40 hr/wk
TIME DISTR. in house 100 % Outside %
BUDGET, op & dev
FUNDED BY IIKW and RUG (1)

RESEARCH STAFF, not included above

USERS, in house 5 scientist, 4 techn. outside
GRAD STUDENTS involved during year
RESEARCH BUDGET, in house
FUNDED BY IIKW and RUG (1)

MAGNET

POLE FACE, diameter (compact) 120 cm, R extraction 52.5 cm
R injection 0 cm
GAP, min 8.6 cm, Field 17.5 kG
min 14 cm, Field 11.0 kG at 150,000
AVERAGE FIELD at R ext 14.8 kG Ampere turns
B max < B > 1.18
NUMBER OF SECTORS { compact 4 } Spiral, max 34 deg
{ separated }
SECTOR ANGLE (SSC) deg
TRIMMING COILS 7 pairs

CONDUCTOR, material and type copper, water cooled
STORED ENERGY (cryogenic) MJ
POWER: main coils 65 max, kW; current stability 10-5
trimming coils 10 max, kW; current stability 10-3
WEIGHT: Fe 28 tons; coils
COOLING system deionised water
ION ENERGY (bending limit) E/A = 29 q/a^2 MEV/amu
(focusing limit) E/A = q/a MeV/amu

ACCELERATION SYSTEM

DEES, number 2 50 deg
BEAM APERTURE 2.5 cm; DC Bias kV
TUNED by, coarse piston fine panel 6
RF 20 to 40 MHz, stable +/- 10
Orb F 5.1 to 20.2 MHz
HARMONICS, RF/Orb F, used 2, 3, 4
DEE-Gnd, max 30 kV, min gap 2 cm
STABILITY, (pk-pk noise)/(pk RF volt) 5.10^-4
ENERGY GAIN, max kv/turn
RF PHASE, stable to +/- 0.2 deg
RF POWER input, max 30 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 10^-6 Torr or mbar
PUMPS, No. Type, Size Balzers BP. 800.011 PF. 7310 DIF. 320
3 m^3/s

ION SOURCES

Livingstone-Jones

INJECTION SYSTEM

internal - axial

EXTRACTION SYSTEM

electrostatic deflector, V_max = 50 kV

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 200 m^2; movable m^2
TARGET STATIONS 7 in 5 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type
COMPUTER model Digital VAX 11-780
OTHER FACILITIES 2 Ge(Li) gamma-spectrometers; NaI(Tl) gamma-gamma coincidence set-up; 2 positron emission tomographs; hot chemistry laboratories; Si(Li) X spectrometer; neutron dosimetry set-up

CHARACTERISTIC BEAMS

Table with columns: PARTICLE, ENERGY (MeV), CURRENT (pA). Rows include 1H, 2H, 3H, 4He, 20Ne, 21Ne, 22Ne, 23Ne, 24Ne, 26Mg, 27Al, 28Si, 29Si, 30Si, 31P, 32S, 33S, 34S, 36S, 37Cl, 39K, 40Ca, 42Ca, 44Ca, 46Ca, 48Ca, 49Ti, 50Ti, 52Cr, 54Cr, 56Fe, 58Fe, 60Ni, 62Ni, 64Ni, 66Ni, 68Ni, 70Zn, 72Zn, 74Zn, 76Zn, 78Zn, 80Zn, 82Zn, 84Zn, 86Zn, 88Zn, 90Zn, 92Zn, 94Zn, 96Zn, 98Zn, 100Zn, 102Zn, 104Zn, 106Zn, 108Zn, 110Zn, 112Zn, 114Zn, 116Zn, 118Zn, 120Zn, 122Zn, 124Zn, 126Zn, 128Zn, 130Zn, 132Zn, 134Zn, 136Zn, 138Zn, 140Zn, 142Zn, 144Zn, 146Zn, 148Zn, 150Zn, 152Zn, 154Zn, 156Zn, 158Zn, 160Zn, 162Zn, 164Zn, 166Zn, 168Zn, 170Zn, 172Zn, 174Zn, 176Zn, 178Zn, 180Zn, 182Zn, 184Zn, 186Zn, 188Zn, 190Zn, 192Zn, 194Zn, 196Zn, 198Zn, 200Zn, 202Zn, 204Zn, 206Zn, 208Zn, 210Zn, 212Zn, 214Zn, 216Zn, 218Zn, 220Zn, 222Zn, 224Zn, 226Zn, 228Zn, 230Zn, 232Zn, 234Zn, 236Zn, 238Zn, 240Zn, 242Zn, 244Zn, 246Zn, 248Zn, 250Zn, 252Zn, 254Zn, 256Zn, 258Zn, 260Zn, 262Zn, 264Zn, 266Zn, 268Zn, 270Zn, 272Zn, 274Zn, 276Zn, 278Zn, 280Zn, 282Zn, 284Zn, 286Zn, 288Zn, 290Zn, 292Zn, 294Zn, 296Zn, 298Zn, 300Zn, 302Zn, 304Zn, 306Zn, 308Zn, 310Zn, 312Zn, 314Zn, 316Zn, 318Zn, 320Zn, 322Zn, 324Zn, 326Zn, 328Zn, 330Zn, 332Zn, 334Zn, 336Zn, 338Zn, 340Zn, 342Zn, 344Zn, 346Zn, 348Zn, 350Zn, 352Zn, 354Zn, 356Zn, 358Zn, 360Zn, 362Zn, 364Zn, 366Zn, 368Zn, 370Zn, 372Zn, 374Zn, 376Zn, 378Zn, 380Zn, 382Zn, 384Zn, 386Zn, 388Zn, 390Zn, 392Zn, 394Zn, 396Zn, 398Zn, 400Zn, 402Zn, 404Zn, 406Zn, 408Zn, 410Zn, 412Zn, 414Zn, 416Zn, 418Zn, 420Zn, 422Zn, 424Zn, 426Zn, 428Zn, 430Zn, 432Zn, 434Zn, 436Zn, 438Zn, 440Zn, 442Zn, 444Zn, 446Zn, 448Zn, 450Zn, 452Zn, 454Zn, 456Zn, 458Zn, 460Zn, 462Zn, 464Zn, 466Zn, 468Zn, 470Zn, 472Zn, 474Zn, 476Zn, 478Zn, 480Zn, 482Zn, 484Zn, 486Zn, 488Zn, 490Zn, 492Zn, 494Zn, 496Zn, 498Zn, 500Zn, 502Zn, 504Zn, 506Zn, 508Zn, 510Zn, 512Zn, 514Zn, 516Zn, 518Zn, 520Zn, 522Zn, 524Zn, 526Zn, 528Zn, 530Zn, 532Zn, 534Zn, 536Zn, 538Zn, 540Zn, 542Zn, 544Zn, 546Zn, 548Zn, 550Zn, 552Zn, 554Zn, 556Zn, 558Zn, 560Zn, 562Zn, 564Zn, 566Zn, 568Zn, 570Zn, 572Zn, 574Zn, 576Zn, 578Zn, 580Zn, 582Zn, 584Zn, 586Zn, 588Zn, 590Zn, 592Zn, 594Zn, 596Zn, 598Zn, 600Zn, 602Zn, 604Zn, 606Zn, 608Zn, 610Zn, 612Zn, 614Zn, 616Zn, 618Zn, 620Zn, 622Zn, 624Zn, 626Zn, 628Zn, 630Zn, 632Zn, 634Zn, 636Zn, 638Zn, 640Zn, 642Zn, 644Zn, 646Zn, 648Zn, 650Zn, 652Zn, 654Zn, 656Zn, 658Zn, 660Zn, 662Zn, 664Zn, 666Zn, 668Zn, 670Zn, 672Zn, 674Zn, 676Zn, 678Zn, 680Zn, 682Zn, 684Zn, 686Zn, 688Zn, 690Zn, 692Zn, 694Zn, 696Zn, 698Zn, 700Zn, 702Zn, 704Zn, 706Zn, 708Zn, 710Zn, 712Zn, 714Zn, 716Zn, 718Zn, 720Zn, 722Zn, 724Zn, 726Zn, 728Zn, 730Zn, 732Zn, 734Zn, 736Zn, 738Zn, 740Zn, 742Zn, 744Zn, 746Zn, 748Zn, 750Zn, 752Zn, 754Zn, 756Zn, 758Zn, 760Zn, 762Zn, 764Zn, 766Zn, 768Zn, 770Zn, 772Zn, 774Zn, 776Zn, 778Zn, 780Zn, 782Zn, 784Zn, 786Zn, 788Zn, 790Zn, 792Zn, 794Zn, 796Zn, 798Zn, 800Zn, 802Zn, 804Zn, 806Zn, 808Zn, 810Zn, 812Zn, 814Zn, 816Zn, 818Zn, 820Zn, 822Zn, 824Zn, 826Zn, 828Zn, 830Zn, 832Zn, 834Zn, 836Zn, 838Zn, 840Zn, 842Zn, 844Zn, 846Zn, 848Zn, 850Zn, 852Zn, 854Zn, 856Zn, 858Zn, 860Zn, 862Zn, 864Zn, 866Zn, 868Zn, 870Zn, 872Zn, 874Zn, 876Zn, 878Zn, 880Zn, 882Zn, 884Zn, 886Zn, 888Zn, 890Zn, 892Zn, 894Zn, 896Zn, 898Zn, 900Zn, 902Zn, 904Zn, 906Zn, 908Zn, 910Zn, 912Zn, 914Zn, 916Zn, 918Zn, 920Zn, 922Zn, 924Zn, 926Zn, 928Zn, 930Zn, 932Zn, 934Zn, 936Zn, 938Zn, 940Zn, 942Zn, 944Zn, 946Zn, 948Zn, 950Zn, 952Zn, 954Zn, 956Zn, 958Zn, 960Zn, 962Zn, 964Zn, 966Zn, 968Zn, 970Zn, 972Zn, 974Zn, 976Zn, 978Zn, 980Zn, 982Zn, 984Zn, 986Zn, 988Zn, 990Zn, 992Zn, 994Zn, 996Zn, 998Zn, 1000Zn.

BEAM PROPERTIES

MEASURED CONDITIONS
PULSE WIDTH RF deg pA of MeV ions
PHASE EXC. max RF deg pA of MeV ions
EXTRACT eff 60-70 % 25 pA of 7 MeV 2H ions
RESOL DELTA E/E 0.5 % pA of MeV ions
EMITTANCE { < .50 axial } pA of MeV
{ < .50 rad }

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS
BIOMEDICAL APPLICAT and ISOTOPE PRODUCTIONS 50%
Charged particle activation analysis 20%
Fast neutron activation analysis 10%

REFERENCES/NOTES Proton induced X-ray emiss. 20%

- 1) NFWO : National Fund for Scientific Research (Belgium)
IIKW : Inter-University Institute for Nuclear Sciences (Belgium)

PLAN VIEW OF FACILITY, COMMENTS, ETC.

