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A Newsletter for those interested in proton, light ion and heavy charged particle radiotherapy.

Number 3 January 1989 Editor: Janet Sisterson Ph. D., HCL

This is the third issue of a newsletter devoted to matters of interest to all those involved, or planning to become involved in proton, light or heavy ion and heavy charged particle radiation therapy. I was very glad to receive so many articles of interest or updated patient totals. It is these contributions that make this newsletter successful and by spreading the word of new facilities coming on-line shows how the field is expanding.

The Harvard Cyclotron Laboratory is very grateful to the officers of the American Proton Development Corporation for their substantial donation to be used expressly for the publication of this newsletter. Since receiving donations was a new, but very welcome, experience for HCL, we added to our learning curve by discovering that the right channel for such donations is a check made out to the "President and Fellows of Harvard College"and sent to HCL.

Please note the article from Loma Linda on the setting up of the database for a Charged Particle Bibliography. This could be a valuable resource for us all but will require some effort by all of us to make it successful.

Information sent to me for inclusion in the newsletter does not need to be extensive but it should be "camera ready" if possible. I am using the following format; flush left; left and right margins of one half inch; single spacing using the 12 point New Century Schoolbook, if you have it, and the Times font, or whatever, if you don't. Graphs and line drawings are welcome.

The deadline for the next newsletter is May 30 1989. Address all correspondence to Dr. Janet Sisterson, Harvard Cyclotron Laboratory, 44 Oxford Street, Cambridge MA 02138. Tel:(617)495–2885 or e-mail:BITNET%"SISTERSON@HARVHEP". HCL now has a FAX machine; the number is (617)495—8054.

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Protons accelerated through the Loma Linda 250 MeV accelerator at Fermilab

According to a conversation with Rich Orr of Fermilab on January 12 1989, they have been able to reach approximately full energy at low current with no major problems. The next big step is work on the extraction system. The shielding experiments will proceed as planned and they expect to ship the accelerator to Loma Linda in July 1989.

FUTURE PTCOG MEETINGS

At the most recent PTCOG meeting, held in Cambridge, MA in September, it was agreed that an effort would be made to schedule future meetings further ahead in order to give members, particularly those outside the U.S., sufficient time to arrange their travel. Consequently, times and locations have been set for the next three meetings. These will be held as follows:-

PTCOG X	Fermilab	April 3rd & 4th 1989	allows us to see the Loma Linda synchrotron in test
PTCOG XI	PSI, Villigen Switzerland	September 18-20 1989	meeting overlaps with the Heavy Particle Therapy Group of EORTC (this is the first PTCOG meeting in Europe)
PTCOG XII	Loma Linda California	Spring of 1990	should allow us to see the Loma Linda facility in action

A call for proposed topics and for members presentations will go out shortly. Anyone who has suggestions, or who wishes to join PTCOG, should contact the secretary of PTCOG, Michael Goitein, Massachusetts General Hospital, Boston, MA 02114.

PTCOG News

The following information was received by the end of December 1988.

Progress on the medical cyclotron at **Michigan State University**:-
The main effort of the medical applications program at Michigan State University's National Superconducting Cyclotron Laboratory continues to focus on completing the neutron therapy cyclotron for Harper Hospital. At the end of November the Harper cyclotron was fully assembled except for ion source and target and the acceleration chamber vacuum system was being checked out. After the vacuum is at operating level, high power tests of the frequency system will begin, this system having been tested at low power earlier in the month, tuned to the correct resonant frequency, and impedance matched to the transmitter. The high power rf tests are expected to take approximately two weeks if no significant problems arise. After the rf is at operating voltage, the ion source will be installed which will require approximately one month and the cyclotron will then be ready for beam tests.

Work on the 250 MeV superconducting synchrocyclotron for proton therapy has for the most part been held in abeyance in recent months in order to focus effort on fine adjustment of various details of the extraction system.

Recently a modest effort had been put into a computer study of a K1600 isochronous cyclotron for heavy ion therapy. This machine would use an external ion source with axial injection as in the K500 and K800 cyclotrons at MSU and would accelerate fully stripped ions to 400 MeV per nucleon — the same energy as the EULIMA project in France. The objective of the MSU K1600 study has been an evaluation of the feasibility of using a compact closed-yoke system as in the K500 and K800, which is in contrast with the open sector design which is being explored at EULIMA. Studies have progressed to the point of laying out a magnet design which gives correct basic orbit characteristics. This magnet has an overall weight of

only 550 tons. The compact magnet design approach then looks generally attractive; further exploration of details will continue as manpower is available. *Henry Blosser, National Superconducting Cyclotron Laboratory, Michigan State University, East Lansing, Michigan 48824-1321.*

ITEP, Moscow, U.S.S.R. sent the following report; they hope to send news and reports frequently. The total number of patients up to the 6 th April 1988 had been 1691. The ITEP medical proton beam is transported to 3 treatment rooms containing 3 installations for proton irradiation of intracranial tumors, AVM's, uveal melanomas, prostate cancers and other diseases. For irradiation five 1.5 month long accelerator runs are used yearly. The medical beam is used 6-9 hours per day, 5-6 days a week. *L. Goldin and V. Khoroshkov, Institute for Theoretical & Experimental Physics, B. Cheremushkinskaya 25, 117259 Moscow, U.S.S.R.*

Progress report from the **Clatterbridge Cyclotron, England**:-
On the 13th October, the first proton beam was run in the new proton therapy room. The beamline was a prototype, the therapy line being still under construction. The beam energy produced by the cyclotron (Scanditronix MC 60) is 62 MeV and it is proposed to commence the proton therapy of ocular melanoma early in 1989.

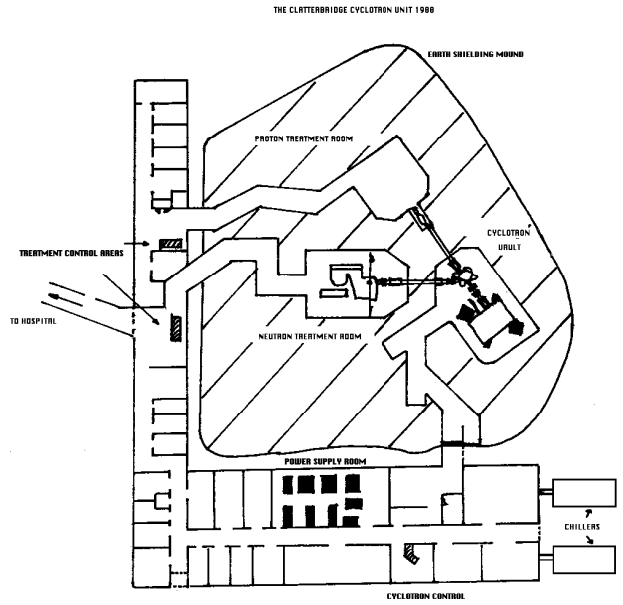


Figure 1

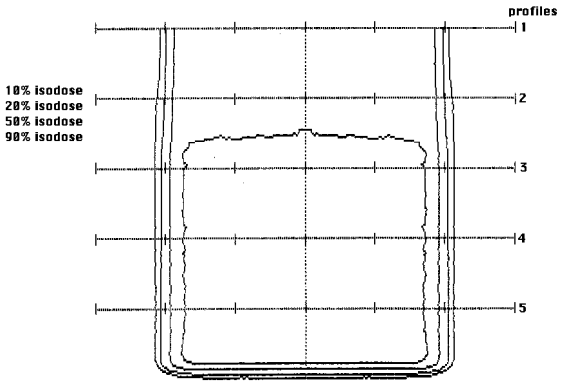
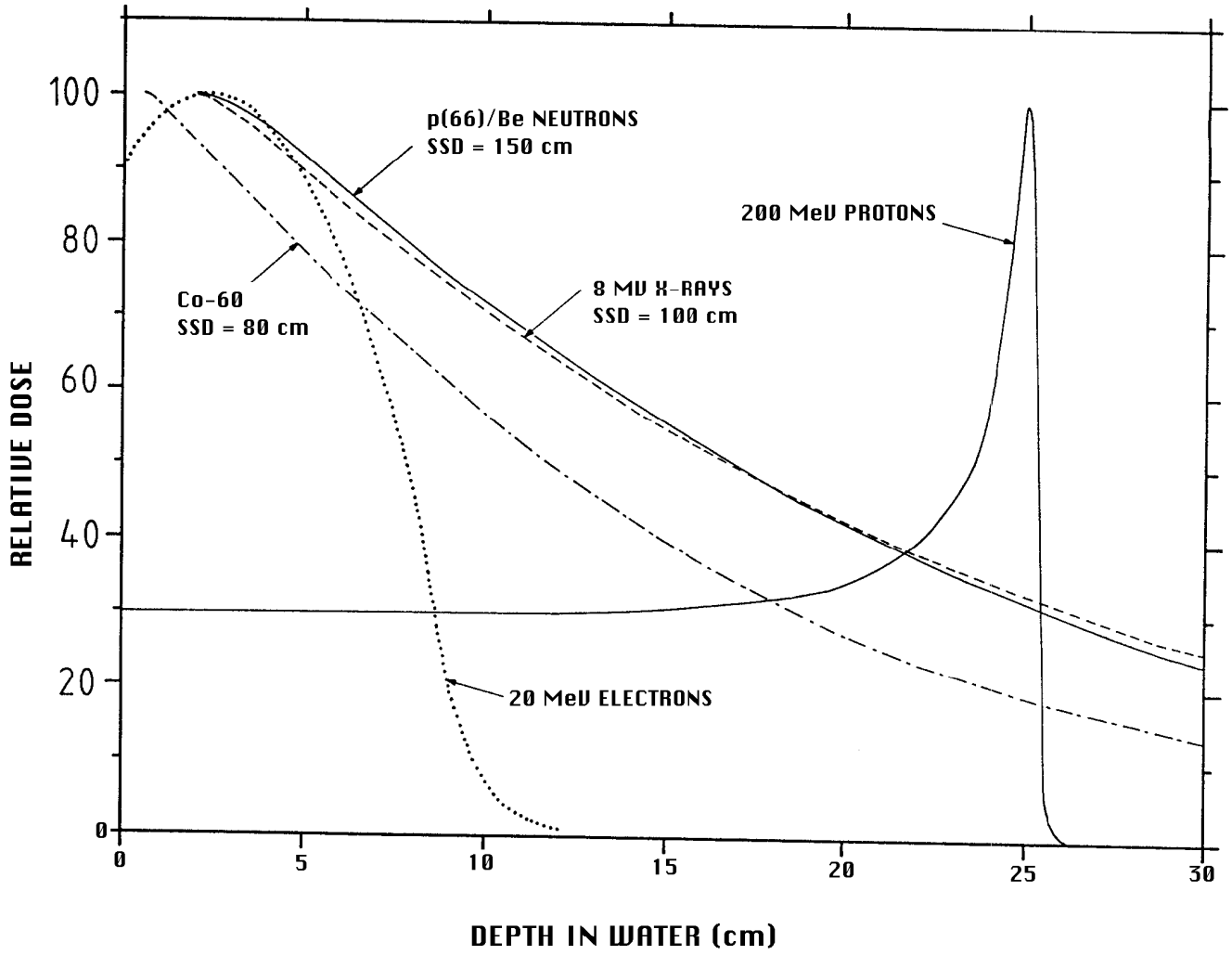


Figure 2

Figure 1: Layout of the cyclotron unit.
Figure 2: Isodose curves measured in water with a miniature diode for a modulated Bragg peak. The 90%-10% penumbra is 2 mm and the distal 90%-10% is 1 mm. The range is 31 mm in water, measured to the distal 90% level. *David Bonnett, MRC Cyclotron Unit, Clatterbridge Hospital, Bebington, Merseyside L63 4JY, England.*

The completion of the neutron therapy facility at the **National Accelerator Centre in South Africa** and the treatment of the first patients in September 1988, allows work to begin on the proton therapy project. The first measurements were made recently in the 200 MeV proton beam.



The depth dose distribution was measured in an uncollimated beam in a water phantom with a 0.3 cm^3 TE ionization chamber. Also shown is the depth dose curve for their isocentric p (66/MeV) / Be (40 MeV) neutron therapy beam.

Two vaults have already been built for proton therapy. One vault will have two horizontal beamlines and the other will have either a vertical or isocentric facility. At present, the first horizontal beam line is being designed, to be used mainly for the treatment of small intracranial lesions. The projected date of completion of this line is sometime in 1990. *Dan Jones, National Accelerator Centre, P.O. Box 72, Faure 7131, South Africa.*

Massachusetts General Hospital and the Harvard Cyclotron Laboratory are proceeding with definite plans for a proton medical facility (PMF) to be located at the Hospital. Charles Perret, senior physicist at PSI (formerly SIN) has spent six months at HCL and MGH where his main effort has been to advance the planning of the PMF. His efforts have led to preliminary site layouts and facility design.

Norbert Liebsch M.D. Ph.D has joined the MGH proton medical group. Norbert received a Ph.D. in elementary particle physics from the University of Munich as well as his medical degree. He completed a residency in diagnostic radiology at the Mallinckrodt Institute of Radiology before changing to radiation

oncology and completing a residency in it at the Mayo Clinic. He is board certified in both diagnostic radiology and radiation oncology and is a valued new member to our team. *Marcia Urie, Department of Radiation Medicine, Massachusetts General Hospital, Boston MA 02114.*

Note;- I thank everyone who contributed articles to this issue. It is exciting to see that there will be some new proton facilities coming on line in the near future.

DIRECTORY OF BITNET ADDRESSES

I am compiling a directory of BITNET (or other computer addresses) for all those people who can be reached by computer. When I have a reasonable number I will list them in an issue of PARTICLES. Please send me your computer address if you would like it included; my BITNET address is on the first page of this issue.

CHARGED PARTICLE BIBLIOGRAPHY

Loma Linda University has begun compiling a list of books, journal articles, conference reports, manuscripts and other sources, all relating to charged-particle research and therapy. The aim is to create a resource available to PTCOG members, one that will be updated several times a year. At present, the bibliographic database is being copyrighted and is available in hard-copy or floppy-disk form. Plans are underway to make the database available in tandem with software that will allow users to search and sort it, for personal applications. It is expected that users will eventually be able to access the database via the BITNET communications network.

Loma Linda will contact PTCOG members soon, with specific information about the database. It is hoped that PTCOG members will contribute their publications, internal reports, and other publicly or privately published sources, so that the database will be up-to-date. Permissions for inclusion will be secured as a routine matter. The database will be reposited at Loma Linda, which also plans to organize a comprehensive charged-particle library as part of its proton-beam research effort. *William Preston, Loma Linda University Medical Center, P.O. Box 2000, 11234 Anderson Street, Loma Linda, CA 92354.*

RECENT PUBLICATIONS

J.M. Sisterson, M.M. Urie, A.M. Koehler, M. Goitein, "Precise shaping of proton beams: the effects of air gaps between compensating bolus and patient." HCL internal report August 1988. the full report has been reviewed for publication and a shortened version will probably be accepted.
M. M. Urie, M. Goitein, "Variable versus fixed modulation of proton beam for treatments in the cranium." submitted for publication; available as an unreviewed preprint.

WORLD WIDE CHARGED PARTICLE PATIENT TOTALS

The following institutions are/were active in the treatment of patients with protons, pions, light or heavy ion beams. Data for the patient totals collected through December 1988.

WHO	WHERE	WHAT	DATE FIRST RX	DATE LAST RX	RECENT PATIENT TOTAL	DATE OF TOTAL
Berkeley 184	CA. U.S.A.	p	1955	— 1957	30	inc. in Berkeley Bev total
Berkeley 184	CA. U.S.A.	He	1957	— 1987	-	inc. in Berkeley Bev total
Berkeley Bev.	CA. U.S.A.	heavy	1975		2187	total all beams. May 1988
Uppsala	Sweden	p	1957	— 1976	73	1976 original series
Uppsala	Sweden	p	1988		?	reopened late 1988
Harvard	MA. U.S.A.	p	1961		4499	Dec 1988
Moscow	U.S.S.R.	p	1965		1691	April 1988
Los Alamos	NM. U.S.A.	π-	1974	— 1982	230	final total 1982
Leningrad	U.S.S.R.	p	1975		508	Dec 1987
Chiba	Japan	p	1979		54	Oct 1988
Dubna	U.S.S.R.	p	1967	— 1977	80	1977 expected to reopen
TRIUMF	Canada	π-	1979		146	May 1988
PSI (SIN)	Switzerland	π-	1980		331	Dec 1987
Tsukuba	Japan	p	1983		69	1987
PSI (SIN)	Switzerland	p	1984		540	Dec 1988
				TOTAL =	10408	all particle beams
				=	707	pion beams
				=	9701	proton and ion beams

PROPOSED NEW FACILITIES
PROTON & ION BEAM THERAPY

INSTITUTION	PLACE	TYPE	DATE 1ST RX?	COMMENTS
Loma Linda	CA. U.S.A.	p	1989	250 MeV accelerator; 4 treatment rooms; 3 gantries.
Clatterbridge	England	p	1989	62 MeV proton beam line added to neutron facility.
Orsay	France	p	1989?	adapt an existing cyclotron no longer being used for physics.
N.A.C.	South Africa	p	1990	200 MeV. 2 treatment rooms; 2 horiz. beam; 1 vert. or gantry.
Nice	France	p	1990	MEDICYC; neutron & proton radiotherapy facility
Chiba	Japan	ion	1993?	HIMAC design complete; funds are available to construct.
Harvard	MA. U.S.A.	p	1995?	new accelerator & facility to be built at MGH
TRIUMF	Canada	p	?	adapt existing proton beam lines to therapy use.
EULIMA	Europe	ion	?	European cooperative venture; location not yet decided.
Louvain-la-Neuve	Belgium	p	?	variable to 90 MeV proton beam; add to neutron facility