



**nucletron®**

**NUCLETRON CORPORATION**

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Columbia, Maryland 21045

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February 4, 1993

Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555

Dear Sirs:

The following pages are submitted for your review in compliance with 10CFR§21.21, Report of Defect.

Should you have any questions or concerns in this matter after review of this information, please feel free to contact the undersigned directly.

Sincerely,  
NUCLETRON CORPORATION

S.P. Teague  
Technical Manager

ST/ca

Enclosure: Report of Defect

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C PDR

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PART 21

REPORT OF DEFECT

microSelectron-High Dose Rate Remote Afterloader

Abbott Northwestern Hospital

February 4, 1993

Prepared by:

S. P. Teague  
Technical Manager  
Nucletron Corporation

930216-0196

In compliance with 10CFR§21.21 Nucletron Corporation is submitting the following report with attachments as listed on the Table of Contents Page.

**Submitted by:**

Stephen P. Teague  
Technical Manager  
Nucletron Corporation

**Date of Report:**

February 4, 1993

**Facility:**

Abbott Northwestern Hospital  
800 E. 28th Street  
Minneapolis, MN 55407

**Device:**

microSelectron-HDR S/N 9282  
S&D No. MD-497-D-104S

**Device Supplier:**

Nucletron International B.V.  
Waardgelders 1  
3905 TH Veenendaal  
The Netherlands

**Device Installer:**

Nucletron Corporation  
9160 Red Branch Road  
Columbia, MD 21045

**Nature of Defect:**

See attached

**Initial Notification:**

- a. By facility 1/6/93
- b. To NRC OPS Center 1/7/93
- c. To Regional Office 1/7/93

**Installed Base**

See Appendix I (User List 1/93)

**Corrective Action Plan:**

- a. Action: Replace defective board
- b. Responsible Party: Nucletron Corporation
- c. Time Schedule: Immediate

**Final Notification:**

- a. to facility 1/7/93
- b. to NRC OPS Center 2/4/93
- c. to Regional Office 1/7/93

**Authorization:**

This preparation of this report is authorized by the following Corporate Office:

Date

2/4/93

Herbert G. Rice, Jr.

Vice President of Operations

## TABLE OF CONTENTS

History of Event

Failure Analysis

Conclusion

Summary

Corrective Action

Appendix I - User List

Appendix II - CPU Board Drawing

**History of Event:**

January 6, 1993 Nucletron Corporation was advised by telephone by Abbott Northwestern Hospital that a failure of the display circuit on the Control Unit of the microSelectron-HDR occurred. The timer display did not correctly reflect the ongoing treatment. The operator responded appropriately in terminating the treatment at that time and a subsequent attempt to place the unit back into treatment was met with the same failure. The unit was then removed from service. On January 7, 1993, the technical manager and a field service engineer from Nucletron Corporation arrived on site to evaluate the failure and develop a corrective action plan. The investigation started with an interview of the individuals involved in the clinical treatment during which this error occurred. The chronology of events leading up to the failure and operator intervention after the failure was detected was noted and was consistent with previous information given to the vendor.

**Failure Analysis**

The unit was powered on and successfully completed a Power On Self Test procedure included in the design of the unit. A treatment comparable to the one under which the error occurred was programmed and the unit placed into treatment mode. The treatment was successfully completed without failure. This process was repeated several times and no failures were detected. Examination of the electronic schematics of the device indicated that the situation could occur if the solid state oscillator that drive the Center Processing Unit on the Control Unit were to fail (Appendix II). The microSelectron-HDR contains two identical CPU's; one in the Treatment Unit, and one in the Control Unit. Both were evaluated. The history of the



error as related by the operators could only be duplicated if the oscillator were removed from the circuit of the Control Unit CPU board. The condition was duplicated several times by removing a jumper that connects the clock output to the input of the CPU chip. The oscillator on the CPU board of the Treatment Unit in the shielded room was also tested. An entirely different series of error codes were generated that differed from the operators description of the event. Iterative testing of the board failed to find a consistent failure of the oscillator circuit. However, the failure could be duplicated repeatedly by interrupting the output line from the electronic circuit.

**Conclusion:**

Intermittant failure of a Center Processing Unit oscillator prevented the operator console display from being continuously updated with treatment times. The CPU in the Treatment Unit continued to perform its design function by treating with appropriate time intervals as programmed. Only the operator display portion of the circuitry was affected. Had the operator not intervened explicitly in this situation the normal treatment for that channel would have been completed and the source retracted to the shielded safe of the unit. An Error Code would have been generated at that time alerting the operator to a failure of the CPU timer.

**Summary:**

An intermittent failure of a computer clock oscillator caused a timer display to fail to update as designed.

**Corrective Action:**

Replacement of the affected CPU board resolved the situation and extensive testing demonstrated that the failure would not reoccur. The defective computer board has been removed from service.

As this failure is a single point failure of an individual component on a discrete circuit board, no system wide corrective action is taken by the vendor at this time. This is the first reported instance of this failure in a five year history of this device.

Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)	Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)
<b>UNITED STATES</b>				<b>CALIFORNIA</b>			
<b>ALABAMA</b>							
Alabama Radiotherapy Associates, P.A. Montgomery	Dr. G. Patton Mr. Skowronski	R P	1. Micro-HDR 2. NPS	Bakersfield Brachytherapy Bakersfield	Dr. J. Byfield Mr. D. Dowswell	R D	1. Micro-HDR 2. NPS
AMI Brookwood Medical Center Birmingham	Dr. R. Dumas, Jr. Mr. E. Young	R P	1. Micro-HDR 2. NPS	Beverly Oncology & Imaging Center Montebello	Dr. J. Thropay Mr. J. Gonzalez	R P	1. HDR 2. Micro-HDR
DCH Regional Medical Center Tuscaloosa	Dr. S. Sanford Mr. K. Mills	R P	1. Micro-HDR 2. NPS	Brookside Hospital San Pablo	Dr. L. Chong Dr. T. Stupak	R P	1. Micro-HDR 2. NPS
East Alabama Medical Center Opelika	Dr. W. Gillson Dr. D. Quinton	R P	1. Micro-HDR 2. NPS	California Endocurietherapy Cancer Center Oakland	Dr. J. Demanes Dr. R. Rodriguez Dr. R. Chin	R R P	1. Micro-HDR 2. NPS
Mobile Infirmary Medical Center Mobile	Dr. R. Russell Dr. M. Williams	R P	1. Micro-HDR 2. NPS	California Medical Center Los Angeles	Dr. Z. Petrovich	R	LDR-3
Dennis L. Olive, M.D. Huntsville	Dr. D. Olive	R	1. Micro-HDR 2. NPS	The Cancer Foundation of Santa Barbara Santa Barbara	Dr. T. Weisenburger Dr. D. James	R P	1. Micro-HDR 2. NPS
Providence Hospital Mobile	Dr. K. Ellingwood Mr. P. Hill	R P	1. Micro-HDR 2. NPS	Cedars-Sinai Comprehensive Cancer Center Los Angeles	Dr. R. Thompson Dr. P. Rosemark	R P	1. Micro-HDR 2. NPS
The University of Alabama at Birmingham Birmingham	Dr. M. Salter Dr. P. Pareek	R P	1. Micro-HDR 2. NPS	Coastal Radiation Oncology Group Thousand Oaks	Dr. R. Hesseigesser Ms. R. Kaplan-James	R P	1. Micro-HDR 2. NPS
<b>ARKANSAS</b>				Fresno Community Hospital Fresno	Dr. D. Wong Dr. Karaoglan	R P	1. Micro-HDR 2. NPS
Northwest Arkansas Rad. Therapy Inst. Springdale	Dr. A. Whiteley Dr. J. Pacyniak	R P	1. Micro-HDR 2. NPS	Kaiser-Permanente Hospital Los Angeles	Dr. R. Kagan Mr. M. Wollin	R P	Micro-HDR
North Little Rock Radiation Oncology Ctr. North Little Rock	Dr. C. Evans Mr. R. Parks	R P	1. Micro-HDR 2. NPS	Kaweah Delta District Hospital Visalia	Dr. M. John Mr. D. Hess	R P	1. Micro-HDR 2. NPS
<b>ARIZONA</b>				Los Angeles County General Hosp Los Angeles	Dr. Z. Petrovich Dr. T. Kamp	R P	LDR-6
Arizona Oncology Services, Inc. Phoenix	Dr. B. Spelser Dr. J. Hicks	R P	1. Micro-HDR 2. NPS	Memorial Hospital Modesto	Dr. L. Doss Mr. T. Ho	R P	1. Micro-HDR 2. NPS
Humana Hospital Phoenix	Dr. B. Spelser Dr. J. Hicks	R P	1. LDR-3 2. Micro-HDR 3. NPS	Mobile Technology, Inc. Los Angeles	Mr. G. Frazier	A	1. Micro-HDR 2. Micro-HDR 3. NPS
St. Joseph's Hospital Phoenix	Dr. B. Spelser Dr. J. Hicks	R P	1. Micro-PDR 2. Micro-HDR 3. NPS	Radiation Medical Group, Inc. San Diego	Dr. P. Anderson Dr. D. Fuller Dr. S. Rosenthal Dr. J. Hilbert	R R R P	1. Micro-HDR 2. NPS
St. Luke's Heart & Lung Center Phoenix	Dr. B. Spelser Dr. J. Hicks	R P	1. Micro-HDR 2. NPS	Radiological Associates of Sacramento Sacramento	Dr. A. Russell Dr. S. Chenery	R P	1. Micro-HDR 2. NPS
Tucson Medical Center Tucson	Dr. E. Rogoff Dr. D. Eagle Ms. J. Conrad	R P D	1. Micro-HDR 2. NPS	Saint Agnes Medical Center Fresno	Dr. M. John Dr. S. Parthasarathy	R P	1. Micro-HDR 2. NPS
				Scripps Memorial Hospital La Jolla	Dr. D. Hodgins Dr. J. Hilbert Dr. J. Kiley	R P P	1. Micro-HDR 2. NPS

KEY: Micro-HDR = MicroSelectron-High Dose Rate  
 Micro-LDR = MicroSelectron-Low Dose Rate  
 Micro-PDR = MicroSelectron-Pulsed Dose Rate

HDR = Selectron-High Dose Rate 60Co  
 LDR = Selectron-Low Dose Rate 137Cs

NPS = Nucletron Planning System  
 EB = External Beam

Low Dose Rate Users  
 High Dose Rate Users  
 Planning System Users  
 Brachytherapy  
 External Beam

46  
 242  
 231  
 12





Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)	Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)
FLORIDA (Continued)				Indiana Univ. - Purdue Univ. at Indianapolis University Hospital Indianapolis	Dr. N. Hornback Dr. G. Sandison	R P	1. Micro-HDR 2. NPS
V.A. Medical Center Miami	Dr. P. Bustillo Mr. J. Fiedler	R P	1. Micro-HDR 2. NPS	Memorial Hospital South Bend	Dr. F. Palritz Mr. A. Hashemi	R P	1. Micro-HDR 2. NPS
West Florida Regional Medical Center Pensacola	Dr. H. Amos Mr. M. Williams	R P	1. Micro-HDR 2. NPS	Methodist Hospital of Indiana Indianapolis	Dr. N. Pugh Mr. J.S. Kent	R P	Micro-HDR
GEORGIA				Parkview Memorial Hospital Fort Wayne	Dr. D. Bajpai Dr. J. Agnew	R P	Micro-HDR
Coliseum Park Cancer Center Macon	Dr. D. McCord Mr. J. Nuskind	R P	1. Micro-HDR 2. NPS	St. Francis Hospital Beech Grove	Dr. E. Sayoc Mr. B. Stewart	R P	1. Micro-HDR 2. NPS
Crawford Long Hospital Atlanta	Dr. I. Crocker Mr. P. Mondalek	R P	1. Micro-HDR 2. NPS	St. Margaret Hospital Hammond	Dr. U. Kalokhe Dr. R. Muller-Runkle	R P	Micro-HDR
Emory University Atlanta	Dr. R. McLaren Dr. P. McGinley Ms. E. Butker	R P P	1. Micro-HDR 2. NPS	St. Vincent Hospital Indianapolis	Dr. J. Horvath Dr. S. Givens Dr. S. Ling	R R P	1. Micro-HDR 2. NPS
Georgia Baptist Medical Center Atlanta	Dr. B. Hershatter Mr. L. Rivera	R P	1. Micro-HDR 2. NPS	IOWA			
Intercommunity Cancer Center Rome	Dr. J. Santoro Mr. J. Upton	R P	1. Micro-HDR 2. NPS	Iowa Methodist Medical Center Des Moines	Dr. H. McBride Dr. C. Bishoff	R P	1. Micro-HDR 2. NPS
John D. Archbold Memorial Hospital Thomasville	Dr. S. Johnson Mr. H. Haynes	R P	1. Micro-HDR 2. NPS	KANSAS			
Northlake Clinic Atlanta	Dr. D. McCord Mr. J. Nuskind	R P	1. Micro-HDR 2. NPS	St. Joseph Medical Center Wichita	Dr. R. Reddi Mr. N. Khater	R P	1. Micro-HDR 2. NPS
Northside Hospital Atlanta	Dr. D. McCord Mr. J. Nuskind Ms. S. Durrence	R P P	1. Micro-HDR 2. NPS	KENTUCKY			
Oconee Regional Cancer Center Dublin	Dr. M. Safer Dr. R. Luthmann	R P	1. Micro-HDR 2. NPS	J. G. Brown Cancer Center University of Louisville Louisville	Dr. R. Lindberg Dr. P. Almond	R P	1. Micro-HDR 2. NPS 3. EB
South Georgia Medical Center Valdosta	Dr. J. Devine Dr. S. Levy	R P	1. NPS	Lexington Clinic Lexington	Dr. O. Mendiondo Dr. L. Beach	R P	1. Micro-HDR 2. NPS
ILLINOIS				LOUISIANA			
Columbus-Cabrini Medical Center Chicago	Dr. H. Thakrar Mr. B. Pothiwala	R P	1. Micro-HDR 2. NPS	Baton Rouge General Medical Center Baton Rouge	Dr. D. Levy	R	1. Micro-HDR 2. NPS
Ingaile Memorial Hospital Harvey	Dr. S. Sanwalani Mr. L. Klonowski	R P	1. Micro-HDR 2. NPS	East Jefferson Hospital Metairie	Dr. M. Hayman Mr. C. Buhler	R P	1. Micro-HDR 2. NPS
Loyola-Hines V.A. Hospital Chicago	Dr. J. Marks Dr. G. Glasgow	R P	1. Micro-LDR 2. LDR-3	Glenwood Regional Medical Center West Monroe	Dr. T. Beatrous Mr. D. Heard	R P	1. Micro-HDR 2. NPS
Memorial Medical Center Springfield	Dr. P.J. Nanavati Mr. R. Maxey	R P	1. Micro-HDR 2. NPS	Iberia Cancer Care Center New Iberia	Dr. M. DeLand Dr. K. Noell Dr. A. Harwood Dr. M. Saunders Mr. J. Duhon	R R R R P	1. Micro-HDR
Methodist Medical Center Peoria	Dr. I. Weigensberg Dr. A. Feldman	R P	1. Micro-HDR 2. NPS	Mary Bird Perkins Cancer Center Baton Rouge	Dr. K. Lo Dr. O. Hidaigo-Salva	R P	1. Micro-HDR 2. NPS
Midwestern Regional Medical Center Zion	Dr. Y. Mehta Dr. R. Edwards	R P	1. Micro-HDR 2. NPS	Ochsner Clinic New Orleans	Dr. R. Kuske Dr. R. Wilenzick	R P	1. Micro-HDR 2. NPS 3. EB
INDIANA							
Community Hospital of Indiana Indianapolis	Dr. N. Bermudez-Webb Dr. M. Bank	R P	Micro-HDR				
Community Hospital Munster	Dr. A. Zajac Mr. E. Zickgraf	R P	1. Micro-HDR 2. NPS				

Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)	Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)
<b>NEW JERSEY (Continued)</b>				North Shore University Hospital Manhasset	Dr. J. Bosworth	R	1. Micro-HDR 2. NPS
St. Barnabas Medical Center Livingston	Dr. A. Zablów Dr. D. Steidley	R P	1. Micro-HDR 2. NPS	Northern Westchester Hospital Center Mount Kisco	Dr. C. Usas Dr. I. Sinclair	R P	1. Micro-HDR 2. NPS
St. Joseph's Hospital Paterson	Dr. T. Haskovic Mr. S. Murthy	R P	1. Micro-HDR 2. NPS	Our Lady of Lourdes Memorial Hospital Binghamton	Dr. M. Shevach Dr. F. Connolly	R P	1. Micro-HDR 2. NPS
United Hospital Medical Center Newark	Dr. G. Dawson Dr. B. Kodery	R P	1. Micro-HDR 2. NPS	Radiotherapy Associates Liverpool	Dr. M. Dalope Dr. R. Graves	R P	1. Micro-HDR 2. NPS
Valley Hospital Ridgewood	Dr. D. Greenblatt Dr. K. Chak	R P	1. Micro-HDR 2. NPS	Roswell Park Memorial Institute Buffalo	Dr. A. Adams Dr. K. Shin Dr. C. Sibata	R R P	1. Micro-HDR 2. LDR-6 3. NPS 4. EB
<b>NEW MEXICO</b>				The Staten Island Hospital Staten Island	Dr. G. Lederman Dr. P. Nizen	R P	1. Micro-HDR 2. NPS
St. Joseph's Cancer Center Albuquerque	Dr. P. Anthony Dr. H. Van Camp	R P	1. Micro-HDR 2. NPS	University of Rochester Medical Center Rochester	Dr. P. Rubin Ms. M. Henzler	R P	1. Micro-HDR 2. NPS
The University of New Mexico Albuquerque	Dr. G. Wong Dr. T. Kirby	R P	1. Micro-HDR 2. NPS	Vassar Brothers Hospital Poughkeepsie	Dr. D. Papadopoulos	R	1. Micro-HDR 2. NPS
<b>NEW YORK</b>				Westchester County Medical Center Westchester	Dr. B. Hilaris Ms. L. Shih	R P	1. Micro-HDR 2. NPS
Albany Medical Center Albany	Dr. H. Kays Dr. D. Chen	R P	1. Micro-HDR 2. NPS	<b>NORTH CAROLINA</b>			
Arnot-Ogden Memorial Hospital Elmira	Dr. J. Krueger Mr. B. Keller	R P	1. Micro-HDR 2. NPS	Memorial Mission Hospital Asheville	Dr. R. Waller Mr. D. Knox	R P	1. Micro-HDR 2. NPS
Beith Israel Hospital New York	Dr. B. Vikram Dr. S. Mishra	R P	1. Micro-HDR 2. NPS	New Hanover Memorial Hospital Wilmington	Dr. M. Meyerson Mr. S. Urquhart	R P	1. Micro-HDR 2. NPS
Booth Memorial Hospital Flushing	Dr. D. Nori Mr. A. Oslan	R P	1. Micro-HDR 2. NPS	St. Joseph's Regional Cancer Center Asheville	Dr. C. Thomas Mr. D. Strongosky Ms. K. Blake	R P D	1. Micro-HDR 2. NPS
Arthur Brimberg, MD, PC Yonkers	Dr. A. Brimberg Mr. D. Simon	R P	1. Micro-HDR 2. NPS 3. EB	University of North Carolina Hospitals Chapel Hill	Dr. M. Varla Dr. E. Chaney	R P	1. Micro-HDR 2. NPS
Columbia Presbyterian Hospital New York	Dr. P. Schiff Dr. H. Amols	R P	1. Micro-HDR 2. NPS	Wayne Radiation Oncology Goldsboro	Dr. M. Meyerson Mr. S. Urquardt	R P	Micro-HDR
Good Samaritan Hospital Suffern	Dr. R. Kaul Dr. V. Kanumalla	R P	1. Micro-HDR 2. NPS	<b>OHIO</b>			
Huntington Hospital Huntington	Dr. R. Byrnes Mr. J. Astarita	R P	1. Micro-HDR 2. NPS	Bethesda Oak Hospital Cincinnati	Dr. K. Murdock Dr. R. Droege	R P	Micro-HDR
Long Island Jewish Medical Center New Hyde Park	Dr. I. Goldberg Dr. Y. Pipman Dr. A. Jamshidi	R P P	1. LDR-3 2. Micro-HDR 3. NPS	Kettering Medical Center Kettering	Dr. G. Bretz Dr. C. Su	R P	1. Micro-HDR 2. NPS
Mt. Sinai Hospital New York	Dr. M. Wesson Dr. J. DeWyngaert Dr. A. Sabbas	R P	1. Micro-HDR 2. NPS	MetroHealth Medical Center Cleveland	Dr. S. Hahn Dr. S. Skubic	R P	1. Micro-HDR 2. NPS
Memorial Sloan-Kettering Cancer Center New York	Dr. L. Harrison Dr. L. Anderson	R P	LDR-6	Miami Valley Hospital Dayton	Dr. R. Field Dr. D. Rueggesser	R P	1. Micro-HDR 2. NPS
Montefiore Medical Center Bronx	Dr. J. Del Rowe Dr. M. Kow	R P	1. Micro-HDR 2. NPS	Ohio State University Hospital Columbus	Dr. S. Nag Dr. R. Gahbauer Dr. N. Samsami	R R P	1. Micro-HDR 2. NPS
New York Hospital New York	Dr. F. Chu Dr. S. Rajaratnam	R P	1. Micro-HDR 2. NPS	Riverside Methodist Hospital Columbus	Dr. R. Kennaugh Mr. J. Niemkiewicz	R P	1. LDR-3 2. Micro-HDR 3. NPS
New York University Medical Center New York	Dr. J. Cooper Dr. S. Barish	R P	1. Micro-HDR 2. NPS				



nucletron®

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Micro-LDR = MicroSelectron-Low Dose Rate  
Micro-PDR = MicroSelectron-Pulsed Dose Rate

HDR = Selectron-High Dose Rate  
LDR = Selectron-Low Dose Rate  
EB = External Beam

NPS = Nucletron Planning System

Page 7 of 11

Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)	Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)
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TEXAS (Continued)

Humana San Antonio San Antonio	Dr. R. Gragg	P	1. Micro-HDR 2. NPS
M.D. Anderson Hospital Houston	Dr. L. Delclos Dr. R. Komaki Dr. T. Rich Mr. J. Cundiff Mr. T. Ochrhan Ms. M. Stovall	P P P P P P	1. LDR-4 2. Micro-HDR 3. NPS 4. LDR-4 5. LDR-4 6. EB
Sierra Medical Center El Paso	Dr. B. Chesbro Mr. J. Winston	P P	1. Micro-HDR 2. NPS
St. Luke's Lutheran Hospital San Antonio	Dr. J. Miller Dr. L. Levy	P P	1. Micro-HDR 2. NPS

VIRGINIA

The Alexandria Hospital Alexandria	Dr. J. Grayson Dr. D. Clarke Ms. D. Kaultman	P P P	1. Micro-HDR 2. NPS
Henrico Doctors Hospital Richmond	Dr. A. Burke, Jr. Mr. L. Thompson	P P	1. Micro-HDR 2. NPS
Medical College of Virginia Virginia Commonwealth University Richmond	Dr. M. Ali Dr. R. Zwicker	P P	1. Micro-HDR 2. NPS
Richmond Radiation Oncology Center Richmond	Dr. W. Sprengle Mr. M. Gilbert	P P	1. Micro-HDR 2. NPS
Riverside Regional Medical Center Newport News	Dr. J. Layser Dr. L. Kirkland	P P	1. Micro-HDR 2. NPS

WASHINGTON

Tumor Institute of Swedish Hospital Seattle	Dr. T. Mate Dr. D. Schumacher	P P	1. Micro-HDR 2. NPS
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WEST VIRGINIA

Bluefield Regional Medical Center Bluefield	Dr. P. Jain Mr. R. Hall	P P	1. Micro-HDR 2. NPS
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WISCONSIN

Milwaukee County Medical Complex Milwaukee	Dr. J. Wilson Dr. M. Gilpin	P P	1. Micro-PDR 2. Micro-HDR 3. NPS
St. Elizabeth Hospital Appleton	Dr. A. Tran Mr. S. Reed	P P	1. Micro-HDR 2. NPS
University of Wisconsin Hospital Madison	Dr. D. Buchler Dr. B. Pallwal Dr. B. Thomsen	P P P	1. Micro-HDR 2. NPS



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Page 9 of 8

Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)	Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)
ARGENTINA							
BRAQUI S.R.L. Buenos Aires	Dr. M. de la Torre Dr. I. Rodriguez Mr. V. Bourel	R R P	1. Micro-HDR 2. NPS	VENEZUELA Hospital Padre Machado Caracas	Dr. G. Ott-Tovar Dr. I. Rodriguez Dr. A. Vera Dr. I. Vaisman Mr. J. Devila	R R R R P	1. Micro-HDR 2. NPS
Centro Interconsulta y Tratamiento Buenos Aires	Dr. A. Capizzano	R	LDR-3				
BRAZIL							
Clinica Sao Carlos Rio de Janeiro	Dr. J. Fuzer	R	1. Micro-HDR 2. NPS	WEST INDIES Queen Elizabeth Hospital Fontabelle, St. Michael, Barbados	Dr. J. Rajendran Mr. J. Porte	R P	1. Micro-HDR 2. NPS 3. EB
CLINRAD - Clinica de Radioterapia Ltda. Sao Paulo	Dr. M.A. Mizziara Dr. S. de Oliveira Dr. S. Libonati Ms. R. Novaes	R R R P	1. Micro-HDR 2. NPS				
Hospital A.C. Camargo Sao Paulo	Dr. N. Tripp Mr. A. J. Pereira	R P	1. Micro-HDR 2. NPS				
Hospital Albert Einstein Sao Paulo	Dr. J.V. Salvajoli Mr. J. Carlos	R P	1. Micro-HDR 2. LDR-6 3. NPS				
Hospital Das Clinicas Sao Paulo	Dr. S. Aisen Dr. L. Scaff Dr. C. Haddad	R P P	1. Micro-HDR 2. NPS 3. EB				
Hospital Sao Vicente de Paulo Rio de Janeiro	Dr. S. Lanes Ms. M. Amanda Abrantes	R P	1. Micro-HDR 2. NPS 3. EB	+ 700 other users in 42 countries			
Instituto Nacional de Cancer Rio de Janeiro	Dr. M. Guizzardi Mr. P. Pereira	R P	1. LDR-6 2. LDR-6				
Santa Casa de Misericordia de Belo Horizonte	Dr. A. Furtado Mr. E. Del Vigna	R P	1. Micro-HDR 2. NPS				
COLOMBIA							
Fundacion Valle del Lili Cali	Dr. V. Borrero Dr. M. Warlenberg Mr. G. Ramirez	R R P	1. Micro-HDR 2. NPS 3. EB				
MEXICO							
Hospital Central Militar Mexico City	Dr. R. De La Huerta Mr. G. Villas	R P	HDR Cobalt <sup>60</sup>				
Hospital General De Mexico De La S.S. Mexico City	Dr. M. Gallardo Mr. G. Villar	R P	Micro-HDR				
Hospital Jose A. Muguerra, S.A. Monterrey	Dr. R. Diaz Mr. C. Diaz	R P	1. Micro-LDR <sup>60</sup> 2. HDR Cobalt <sup>60</sup>				

+ 700 other users in 42 countries



1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

