



nucletron®

NUCLETRON CORPORATION

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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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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

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
850 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.
Waardgelder 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:

2/4/93
Date

Herbert G. Rice, Jr.
Herbert G. Rice, Jr.
Vice President of Operations

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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.

Selectron User List - North/South America

Issue 93.1

9160 Red Branch Road
Columbia, Maryland 21045

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Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)	Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)
UNITED STATES				CALIFORNIA			
ALABAMA				Bakersfield Brachytherapy			
Alabama Radiotherapy Associates, P.A. Montgomery	Dr. G. Patton Mr. Skowronski	R P	1. Micro-HDR 2. NPS	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. Throley 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. Chung Dr. T. Stupar	R P	1. Micro-HDR 2. NPS
East Alabama Medical Center Opelika	Dr. W. Glisson 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 P 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. Hesseigester Ms. R. Kaplan-James	R P	1. Micro-HDR 2. NPS
ARKANSAS				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
ARIZONA				Los Angeles County General Hosp Los Angeles	Dr. Z. Petrovich Dr. T. Kampp	R P	LDR-6
Arizona Oncology Services, Inc. Phoenix	Dr. B. Speiser 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. Speiser 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. Speiser 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. Speiser 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

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242
231
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Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)
CALIFORNIA (Continued)			
University of California Davis Medical Center Sacramento	Dr. T. Phillips Dr. H. Kubo	R P	1. Micro-HDR 2. NPS
University of California, San Francisco San Francisco	Dr. T. Phillips Dr. K. Weaver	R P	1. LDR-6 2. Micro-PDR
University of Southern California Kenneth J. Norris Jr. Cancer Hosp Los Angeles	Dr. Z. Petrovich Dr. G. Luxton	R P	LDR-3
CONNECTICUT			
St. Francis Hospital Hartford	Dr. B. Kaplan Dr. G. Marolt	R P	1. LDR-3 2. Micro-HDR 3. NPS
Hospital of Saint Raphael New Haven	Dr. E. O'Connor Dr. C. Gignac	R P	1. Micro-HDR 2. NPS
COLORADO			
Presbyterian/St. Luke's Medical Center Denver	Dr. R. Lienert Mr. D. Herron	R P	1. Micro-HDR 2. NPS
Memorial Hospital Colorado Springs	Dr. J. Long Mr. T. Steinberg	R P	1. Micro-HDR 2. NPS
FLORIDA			
Baptist Hospital of Miami Miami	Dr. A. Lewin Dr. A. Abitol Dr. J. Ting	R R P	1. Micro-HDR 2. NPS
Baptist Medical Center Jacksonville	Dr. J. Wells Mr. S. Lu	R P	1. Micro-HDR 2. NPS
Bay Medical Center Panama City	Dr. E. Brodie Dr. D. Quinton	R P	1. Micro-HDR 2. NPS
Bethesda Memorial Hospital Boynton Beach	Dr. T. Spear Mr. S. Kirkpatrick	R P	1. Micro-HDR 2. NPS
Boca Raton Community Hospital Boca Raton	Dr. P. Smith Dr. D. Giel	R P	1. Micro-HDR 2. NPS
Cancer Care Center of Palm Bay Palm Bay	Dr. S. Charles Mr. D. Saini	R P	1. Micro-HDR 2. NPS
Cedars Medical Center Miami	Dr. M. Pomper Dr. R. Heller Mr. D. Pender	R R P	1. Micro-HDR 2. NPS
Central Florida Radiation Onc. Group Eustis	Dr. R. Purdon Mr. J. Barton	R P	1. Micro-HDR 2. NPS
Central Florida Radiation Onc. Group Kissimmee	Dr. R. Krochak Dr. H. Holloway	R P	1. Micro-HDR 2. NPS
Central Florida Radiation Onc. Group Winter Park	Dr. R. Krochak Ms. L. Barton	R P	1. Micro-HDR 2. NPS

Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)
Central Florida Radiation Therapy Associates of Volusia County Deland	Dr. M. Pirkowski Mr. J. Barton	R P	1. Micro-HDR 2. NPS
Charlotte County Radiation Therapy Regional Center Port Charlotte	Dr. D. Dosoretz Mr. D. Gaimarini	R P	1. Micro-HDR 2. NPS
Community Radiation Therapy Center Inverness	Dr. R. Putzeys Ms. M. Rivera	R P	1. Micro-HDR 2. NPS
Florida Hospital Orlando	Dr. J. Piro-y-Torres Mr. C. Warner	R P	1. Micro-HDR 2. NPS
Gulf Coast Cancer Treatment Center Panama City	Dr. D. McCord Mr. J. Nuskind	R P	1. Micro-HDR 2. NPS
Halifax Medical Center Daytona Beach	Dr. T. Bloom Mr. P. Marvin	R P	1. Micro-HDR 2. NPS
Holmes Regional Medical Center Melbourne	Dr. D. Jackson	R	1. Micro-HDR 2. NPS
Marion Community Hospital Ocala	Dr. N. Anderson Ms. M. Rivera	R P	1. Micro-HDR 2. NPS
Martin Memorial Hospital Stuart	Dr. S. Gasiorok Mr. R. Young	R P	1. Micro-HDR 2. NPS
Mercy Hospital Miami	Dr. J. Lozano Dr. H. Turner	R P	1. Micro-HDR 2. NPS
Morton F. Plant Hospital Clearwater	Dr. A. Trajna Dr. R. Geisler Mr. B. Patel	R R P	1. Micro-HDR 2. NPS
Orlando Regional Medical Center Orlando	Dr. A. Forbes Mr. G. McNeerney	R P	1. Micro-HDR 2. NPS
Palms of Pasadena Hospital St. Petersburg	Dr. D. Chacko Dr. R. McDougall	R P	1. Micro-HDR 2. NPS
Radiation Therapy Centers of Brevard Rockledge	Dr. J. Gieblink	R	1. Micro-HDR 2. NPS
Radiation Therapy Regional Center Fort Myers	Dr. D. Dosoretz Mr. B. Thompson	R P	1. Micro-HDR 2. NPS
Sacred Heart Hospital Pensacola	Dr. J. Bujinski Ms. K. Walker	R P	1. Micro-HDR 2. NPS
Sarasota Memorial Hospital Sarasota	Dr. A. Porter Dr. R. Landers	R P	1. Micro-HDR 2. NPS
St. Vincent's Hospital Jacksonville	Dr. M. Safer Dr. S. Ackerman Dr. R. Luthmann	R R P	1. Micro-HDR 2. NPS 3. EB
University Community Hospital Tampa	Dr. R. Sorace Dr. R. Koval Mr. B. Wedding	R R P	1. Micro-HDR 2. NPS
University of Florida/Shands Hospital Gainesville	Dr. N. Mendenhall Dr. F. Bova	R P	1. Micro-HDR 2. NPS
University of Miami Jackson Memorial Hospital Miami	Dr. J. Schwade Dr. P. Houdek	R 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 = Reaction-High Dose Rate
LDR = Reaction-Low Dose Rate
EB = External Beam

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Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)
FLORIDA (Continued)			
V.A. Medical Center Miami	Dr. P. Bustillo Mr. J. Fiedler	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
GEORGIA			
Coliseum Park Cancer Center Macon	Dr. D. McCord Mr. J. Nuskind	R p	1. Micro-HDR 2. NPS
Crawford Long Hospital Atlanta	Dr. I. Crocker Mr. P. Mondalek	R p	1. Micro-HDR 2. NPS
Emory University Atlanta	Dr. R. McLaren Dr. P. McGinley Ms. E. Butler	R p p	1. Micro-HDR 2. NPS
Georgia Baptist Medical Center Atlanta	Dr. B. Harshbarger Mr. L. Rivera	R p	1. Micro-HDR 2. NPS
Intercommunity Cancer Center Rome	Dr. J. Santoro Mr. J. Upton	R p	1. Micro-HDR 2. NPS
John D. Archibald Memorial Hospital Thomasville	Dr. S. Johnson Mr. H. Haynes	R p	1. Micro-HDR 2. NPS
Northlake Clinic Atlanta	Dr. D. McCord Mr. J. Nuskind	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
Oconee Regional Cancer Center Dublin	Dr. M. Sater Dr. R. Luthmann	R p	1. Micro-HDR 2. NPS
South Georgia Medical Center Valdosta	Dr. J. Devine Dr. S. Levy	R p	1. NPS
ILLINOIS			
Columbus-Cabrini Medical Center Chicago	Dr. H. Thakrar Mr. B. Pothavala	R p	1. Micro-HDR 2. NPS
Ingalls Memorial Hospital Harvey	Dr. S. Sarwalani Mr. L. Klonowski	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
Memorial Medical Center Springfield	Dr. P.J. Narasim Mr. R. Maxey	R p	1. Micro-HDR 2. NPS 3. EB
Methodist Medical Center Peoria	Dr. I. Weigensberg Dr. A. Feldman	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
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. Ziegler	R p	1. Micro-HDR 2. NPS
IOWA			
Iowa Methodist Medical Center Des Moines	Dr. H. McBride Dr. C. Bishoff	R p	1. Micro-HDR 2. NPS
KANSAS			
St. Joseph Medical Center Wichita	Dr. R. Reddi Mr. N. Khater	R p	1. Micro-HDR 2. NPS
KENTUCKY			
J. G. Brown Cancer Center University of Louisville Louisville	Dr. R. Lindberg Dr. P. Almond	R p	1. Micro-HDR 2. NPS 3. EB
Lexington Clinic Lexington	Dr. O. Mendonco Dr. L. Beach	R p	1. Micro-HDR 2. NPS
LOUISIANA			
Paton Rouge General Medical Center Baton Rouge	Dr. D. Levy	R	1. Micro-HDR 2. NPS
East Jefferson Hospital Metairie	Dr. M. Hayman Mr. C. Butler	R p	1. Micro-HDR 2. NPS
Glenwood Regional Medical Center West Monroe	Dr. T. Bastrous Mr. D. Heard	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. Dufon	R p p p p p	1. Micro-HDR
Mary Bird Perkins Cancer Center Baton Rouge	Dr. K. Lo Dr. O. Hidalgo-Salva	R p	1. Micro-HDR 2. NPS
Ochsner Clinic New Orleans	Dr. R. Gunka Dr. R. Wilenski	R p	1. Micro-HDR 2. NPS 3. EB

Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)
LOUISIANA (Continued)			
Romagosa Radiation Oncology Center Lafayette	Dr. M. DeLand Dr. K. Noell Dr. A. Harwood Mr. J. Duhon	R R R P	1. Micro-HDR 2. NPS
St. Francis Cabrini Hospital Alexandria	Dr. L. Menache Ms. S. Conley	R P	1. Micro-HDR 2. NPS
Schumpert Medical Center Shreveport	Dr. S. Hightower Mr. R. Dubash	R P	1. Micro-HDR 2. NPS
Touro Infirmary Metairie	Dr. M. Sanders Dr. L. Melavie	R P	1. Micro-HDR 2. NPS
West Jefferson Medical Center Marrero	Dr. T. Kraus Mr. M. Helmann	R P	1. Micro-HDR 2. NPS
MASSACHUSETTS			
Massachusetts General Hospital Boston	Dr. N. Choi Dr. T. Mauceri	R P	1. Micro-HDR 2. NPS
Univ. of Massachusetts Medical Center Worcester	Dr. T. Fitzgerald Dr. I. Das	R P	LDR-3
MARYLAND			
University of Maryland Medical System Baltimore	Dr. O. Salazar Dr. W. Sewchand	R P	1. Micro-HDR 2. NPS
National Institutes of Health Rockville	Dr. A. Epstein Dr. J. Van de Geijn	R P	1. LDR-3 2. NPS
Washington County Hospital Hagerstown	Dr. L. Linares Mr. N. Bautio	R P	1. Micro-HDR 2. NPS
MICHIGAN			
Blodgett Memorial Medical Center Grand Rapids	Dr. W. Ewald Mr. R. Smereka	R P	1. Micro-HDR 2. NPS
Harper-Grace Hospital Wayne State University Detroit	Dr. A. Porter Dr. C. Orton Mr. G. Ezzell	R P P	1. HDR 2. Micro-HDR 3. NPS
Oakwood Hospital Dearborn	Dr. A. Harskovic Dr. T. Sandhu	R P	1. Micro-HDR 2. NPS
St. Mary's Health Services Grand Rapids	Dr. M. Tay Dr. S. Leung	R P	1. Micro-HDR 2. NPS
William Beaumont Hospital Royal Oak	Dr. A. Martinez Mr. G. Edmundson	R P	1. Micro-LDR 2. Micro-LDR 3. Micro-HDR 4. NPS
MINNESOTA			
Abbott Northwestern Hospital Minneapolis	Dr. T. Kim Dr. T. Payne Mr. T. Murphy	R P P	1. Micro-HDR 2. NPS

Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)
MISSISSIPPI			
Meridian Radiation Oncology Center Meridian	Dr. R. Zimmerman Mr. A. Douglas	R P	1. Micro-HDR 2. NPS
Methodist Medical Center Jackson	Dr. S. Zachow Dr. A. Lavassani-Dana	R P	1. Micro-HDR 2. NPS
MISSOURI			
Boone Hospital Center Columbia	Dr. J. Murrell Mr. T. Sullivan	R P	1. Micro-HDR 2. NPS
DePaul Health Center Bridgeton	Dr. R. Devineni Mr. E. Siessinger	R P	1. Micro-HDR 2. NPS
Mallinckrodt Institute of Radiology St. Louis	Dr. C. Perez Dr. P. Grigsby Dr. J. Purdy Dr. J. Williamson	R R P P	1. Micro-LDR 2. Micro-LDR 3. Micro-PDR 4. LDR-6 5. Micro-HDR 6. NPS
Research Medical Center Kansas City	Dr. B. Throne Dr. J. Paradelo Dr. W. Kopecky	R R P	Micro-HDR
St. Louis University Medical Center St. Louis	Dr. T. Roy Dr. J. Dawson	R P	1. Micro-HDR 2. NPS
St. Luke's Hospital Charterfield	Dr. D. Garcia Dr. R. Drzymala	R P	1. Micro-HDR 2. NPS
St. Mary's Hospital St. Louis	Dr. J. Chen	R	1. Micro-HDR 2. NPS
NEBRASKA			
Immanuel Medical Center Omaha	Dr. R. Albrink Mr. C. Osborne	R P	1. Micro-HDR 1. NPS
Lincoln General Hospital Lincoln	Dr. D. Howell-Burke Mr. L. Jablonski	R P	1. Micro-HDR 2. NPS
Nebraska Methodist Hospital Omaha	Dr. K. Schewe Mr. M. Goede	R P	1. Micro-HDR 2. NPS
NEW JERSEY			
Bayonne Hospital Bayonne	Mr. S. Lam	R P	1. Micro-HDR 2. NPS
Dover General Hospital & Medical Center Dover	Dr. D. Cann Dr. A. Buznitsky Mr. G. Zacharopoulos	R R P	1. Micro-HDR
Elizabeth General Medical Center Elizabeth	Dr. E. Finkelstein Mr. R. Tenpenny	R P	NPS
John F. Kennedy Medical Center Edison	Dr. L. Rogow Dr. W. Hillsinger	R P	1. Micro-HDR 2. NPS
Mountainside Hospital Montclair	Dr. R. Stabile Mr. R. Sasso	R P	1. Micro-HDR 2. NPS

Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)	Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)
NEW JERSEY (Continued)				North Shore University Hospital Manhasset	Dr. J. Bosworth	R	1. Micro-HDR 2. NPS
St. Barnabas Medical Center Livingston	Dr. A. Zablow Dr. D. Steadley	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. Herskovic 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	Radiology Associates Liverpool	Dr. M. Delope 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 P P	1. Micro-HDR 2. LDR-6 3. NPS 4. EB
NEW MEXICO				The Staten Island Hospital Staten Island	Dr. G. Lederman Dr. P. Nizan	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
NEW YORK				Westchester County Medical Center Westchester	Dr. B. Hilaris Ms. L. Shih	R P	1. Micro-HDR 2. NPS
Albany Medical Center Albany	Dr. H. Keys Dr. D. Chon	R P	1. Micro-HDR 2. NPS	NORTH CAROLINA			
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
Beth 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. Osian	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 P	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. Varie Dr. E. Chaney	R P	1. Micro-HDR 2. NPS
Columbia Presbyterian Hospital New York	Dr. P. Schiff Dr. H. Arnols	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	OHIO			
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. Wasson Dr. J. DeWyngaert Dr. A. Iabba	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. Rueggsegger	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. Gubauer Dr. N. Samsami	R P P	1. Micro-HDR 2. NPS
New York Hospital New York	Dr. F. Chu Dr. S. Rajaratham	R P	1. Micro-HDR 2. NPS	Riverside Methodist Hospital Columbus	Dr. R. Kenneough 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				

Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)	Hospital/Address	Radiotherapist/ Physicist/Dosimetrist	Job	System(s)
OHIO (Continued)				Western Pennsylvania Hospital Pittsburgh	Dr. R. Leen Dr. J. Figura Dr. M. Eddy	R R P	Micro-LDR
Southside Medical Center Youngstown	Dr. E. Svenson Mr. C. Wissuchek	R P	1. Micro-HDR 2. NPS	Williamsport Regional Rad. Onc. Ctr. Williamsport	Dr. E. Karp Dr. T. Padikal	R P	1. Micro-HDR 2. NPS
St. Vincent Charity Hospital Cleveland	Dr. D. Kim Mr. R. Scala	R P	1. Micro-HDR 2. NPS	Wilkes-Barre General Hospital Wilkes-Barre	Dr. N. Schulman Dr. E. Synn	R P	1. Micro-HDR 2. NPS
OKLAHOMA				RHODE ISLAND			
Cancer Treatment Center of Tulsa Tulsa	Dr. J. P. Flynn Mr. C. Pearce	R D	1. Micro-HDR 2. NPS	Philip G. Maddock, M.D. Warwick	Dr. P. Maddock	R	1. Micro-HDR 2. NPS
HCA Hospital Oklahoma City	Dr. L. Medbery, III Dr. C. Richter	R P	1. Micro-HDR 2. NPS	SOUTH CAROLINA			
Oklahoma Medical Center Oklahoma City	Dr. C. Bogardus Dr. D. Raeside	R P	1. Micro-HDR 2. NPS	Lexington Medical Center West Columbia	Dr. J. Ravita Dr. J. Fenn	R P	1. Micro-HDR 2. NPS
OREGON				McLeod Regional Medical Center Florence	Dr. L. Grubb Ms. W. Bryant	R P	1. Micro-HDR 2. NPS
Good Samaritan Hospital and Medical Ctr. Portland	Dr. M. Schray Mr. R. Miller	R P	1. Micro-HDR 2. NPS	Medical University of South Carolina Charleston	Dr. J. Jenrette Dr. J. Fenn	R P	1. Micro-HDR 2. NPS
PENNSYLVANIA				Richland Memorial Hospital Columbia	Dr. R. Boulware Dr. N. Detorie	R P	1. Micro-HDR 2. NPS
Altoona Hospital Altoona	Dr. R. Raju Mr. L. Hahn	R P	1. Micro-HDR 2. NPS	Spartanburg Regional Medical Center Spartanburg	Dr. J. Josey Mr. D. Vassy	R P	1. Micro-HDR 2. NPS
Fox Chase Cancer Center Philadelphia	Dr. G. Henks Dr. R. Landiano Ms. M. Hunt	R R P	1. Micro-HDR 2. NPS	TENNESSEE			
Gelsinger Medical Center Danville	Dr. J. Clement Dr. D. Wright Dr. J. Glover	R P P	1. Micro-HDR 2. NPS	Holston Valley Hospital & Medical Center Kingsport	Dr. B. Talton Dr. A. Cole	R P	1. Micro-HDR 2. NPS
Lancaster General Hospital Lancaster	Dr. J. Lanzillo Mr. D. Justice	R P	1. Micro-HDR 2. NPS	Jackson-Madison Co. General Hospital Jackson	Dr. W. Farmer Mr. P. Chaplin	R P	1. Micro-HDR 2. NPS
Medical Center of Beaver Beaver	Dr. R. Thewas Mr. T. Combina	R P	1. Micro-HDR 2. NPS	Johnson City Medical Center Johnson City	Dr. R. Peyton Mr. D. Strongosky	R P	1. Micro-HDR 2. NPS
Mercy Hospital Altoona	Dr. J. Schocker Mr. G. Price	R P	1. Micro-HDR 2. NPS	St. Thomas Hospital Nashville	Dr. M. Bolin Mr. K. Working	R P	1. Micro-HDR 2. NPS
Mercy Hospital Scranton	Dr. M. Balkad Dr. H. Brereton Mr. A. Gooch	R P P	1. Micro-HDR 2. NPS 3. EB	TEXAS			
Robert Packer Hospital Sayre	Dr. M. Cheng Dr. T. Nair	R P	1. Micro-HDR 2. NPS	Baptist Memorial Hospital System San Antonio	Dr. J. Langey Dr. R. Nydegger	R P	1. Micro-HDR 2. NPS
Saint Vincent Health Center Erie	Dr. R. Chahalwal Dr. G. Williams	R P	1. Micro-HDR 2. NPS	Cancer Therapy Research Center San Antonio	Dr. J. Mira Dr. J. Hevassey	R P	1. Micro-HDR 2. NPS
Shadyside Hospital Pittsburgh	Dr. A. Calend	P	1. Micro-HDR 2. NPS	Harrington Cancer Center Amarillo	Dr. J. Arko Dr. S. Sarangkasiri	R P	1. Micro-HDR 2. NPS
Thomas Jefferson University Hospital Philadelphia	Dr. N. Suntharalingam Dr. C. Mansfield Dr. F. Waterman	R R P	1. Micro-HDR 2. NPS	Harris Methodist HEB Bedford	Dr. C. Studey Mr. E. Scarbrough	R P	1. Micro-HDR 2. NPS
University of Pittsburgh Medical Center Pittsburgh	Dr. E. Mullen Dr. A. Wu	R P	1. Micro-HDR 2. NPS	Harris Methodist Hospital Fort Worth	Dr. R. Chan Dr. K. Chang	R P	LDR-6
				Humana Hospital, Clear Lake Webster	Dr. D. Walker Mr. C. Robinson	R P	LDR-3



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KEY: Micro-HDR = MicroSelectron High Dose Rate
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

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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. Cheshbro 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. Gayson Dr. D. Clarke Ms. D. Kaufman	P P P	1. Micro-HDR 2. NPS				
Hentico 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. Laysar 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. Glinn	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. Pahlwal Dr. B. Thomadsen	P P P	1. Micro-HDR 2. NPS				

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CANADA							
ALBERTA							
Tom Baker Cancer Centre Calgary	Dr. K. Arthur Dr. P. Corbett Mr. G. Douglas Mr. K. Knibutat Ms. K. Breitman	R R P P P	1. LDR-3 2. NPS 3. Micro-HDR	Ontario Cancer Institute/ Princess Margaret Hospital Toronto	Dr. M. McLean Dr. P. Leung	R P	1. Micro-PDR 2. NPS
Cross Cancer Institute Edmonton	Dr. B. Pearcey Dr. J. Springer Dr. R. Sloboda	R P P	1. LDR-6 2. Micro-LDR 3. Micro-LDR 4. NPS 5. Micro-HDR	Ottawa Civic Hospital Ottawa	Dr. B. Esche Dr. J. Cygler	R P	1. LDR-3 2. Micro-HDR 3. NPS
BRITISH COLUMBIA							
British Columbia Cancer Agency Vancouver	Dr. S. Jackson Dr. E. El-Khattab	R P	1. LDR-6 2. Micro-HDR	Ottawa General Regional Cancer Centre Ottawa	Dr. B. Esche Dr. L. Gerig	R P	1. LDR-3
Victoria Cancer Clinic Victoria	Dr. P. Coy Dr. D. Linekin	R P	LDR-3	Thunder Bay Regional Cancer Centre Thunder Bay	Dr. J. Kotalik Mr. B. Arjune	R P	LDR-3
NEW BRUNSWICK							
St. John Regional Hospital New Brunswick	Dr. J. Carson Mr. N. Kulkarni	R P	LDR-6	Toronto-Bayview Clinic Toronto	Dr. R. Jenkin Dr. C. Danjoux	R R	1. LDR-3 2. LDR-3
George L. Dumont Hospital New Brunswick	Dr. C. Arseneault	P	1. Micro-HDR 2. LDR-6	Windsor Cancer Clinic Windsor	Dr. G. Mok Mr. M. Smocovitis Mr. M. Gribble	R P P	1. LDR-3 2. NPS 3. Micro-HDR
NEWFOUNDLAND							
Newfoundland Cancer Clinic St. John	Dr. K. Hong Dr. P.K. Ganguly Dr. C. Pujara	R R P	LDR-6	QUEBEC			
NOVA SCOTIA							
Halifax Regional Cancer Centre Halifax	Dr. P. Fitzpatrick Dr. P. Joseph Dr. J. Aldrich	R R P	1. LDR-6 2. Micro-HDR 3. NPS	Hospital Notre Dame Montreal	Dr. J. Guay Mr. R. Besner	R P P	1. Micro-HDR 2. LDR-6 3. NPS
ONTARIO							
Hamilton Clinic Hamilton	Dr. I. Hodson Dr. B. Wilson	R P	1. LDR-3 2. LDR-3	Hotel-Dieu du Quebec Quebec	Dr. J. Roy Dr. L. Beaudoin	R P	1. LDR-6 2. Micro-HDR 3. NPS
Kingston Regional Cancer Centre Kingston	Dr. A. Ginsburg Dr. P. Shragge	R P	1. LDR-3 2. LDR-3	Maisonnette-Rosemont Hospital Montreal	Dr. J. Mercier Mr. N. Nadon	R P	1. Micro-HDR 2. NPS
Laurentian Hospital Sudbury	Dr. R. Bissett Dr. P. Duncombe	R P	LDR-6	Royal Victoria Hospital/ McGill University Montreal	Dr. T. Roman Dr. E. Podgorsak	R P	1. HDR 2. LDR-3 3. Micro-HDR
London Regional Cancer Centre London	Dr. J. Gilchrist Dr. D. Dawson Dr. R. Barnett	R R R	1. LDR-3 2. LDR-3 3. Micro-LDR 4. Micro-HDR 5. NPS				
Northeastern Ontario Cancer Centre Sudbury	Dr. R. Bissett Dr. P. Duncombe	R R	1. Micro-HDR 2. NPS				



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KEY:

Micro-HDR = Microfraction-High Dose Rate
Micro-LDR = Microfraction-Low Dose Rate
Micro-JDR = Microfraction-Pulsed Dose Rate

HDR = Selection-High Dose Rate
LDR = Selection-Low Dose Rate

NPS = Noninvasive Planning System
EB = External Beam

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ARGENTINA							
BRAQUI S.R.L. Buenos Aires	Dr. M. de la Torre Dr. I. Rodriguez Mr. V. Bouriel	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. Vasman Mr. J. Davila	R R R R R	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	Queen Elizabeth Hospital Fontabelle, St. Michael, Barbados	Dr. J. Rajendran Mr. J. Forte	R P	1. Micro-HDR 2. NPS 3. EB
CLINRAD - Clinica de Radioterapia Ltda. Sao Paulo	Dr. M.A. Miziera Dr. S. de Oliveira Dr. S. Libonati Ms. R. Novais	R R R P	1. Micro-HDR 2. NPS				
Hospital A.C. Camargo Sao Paulo	Dr. N. Trippa Mr. A. J. Pereira	R P	1. Micro-HDR 2. NPS	WEST INDIES			
Hospital Albert Einstein Sao Paulo	Dr. J.V. Salvajoli Mr. J. Carlos	R P	1. Micro-HDR 2. LDR-6 3. NPS	+ 700 other users in 42 countries			
Hospital Das Clinicas Sao Paulo	Dr. S. Aisen Dr. L. Scalfi 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. Arminda Abrantes	R P	1. Micro-HDR 2. NPS 3. EB				
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. Wartenberg 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 ⁶⁰				
Hospital General De Mexico De La S.S. Mexico City	Dr. M. Gallardo Mr. G. Villas	R P	Micro-HDR				
Hospital Jose A. Muguerra, S.A. Monterrey	Dr. R. Diaz Mr. C. Diaz	R P	1. Micro-LDR 2. HDR Cobalt ⁶⁰				

