

**Personal Information**

Christopher G. Soares, Ph.D.

Office:  
C-211, Bldg. 245  
National Institute of Standards & Technology  
100 Bureau Dr., Stop 8460  
Gaithersburg, MD 20899-8460  
(301) 975-5589

Home:

11940 Buffington Rd.  
Woodsboro, MD 21798  
(301) 898-9559

Born San Jose, CA, January 22, 1949

US citizenship

Foreign languages: French & German

**Licensure**

None

**Certification**

None

**Education**

George Washington University, Washington, DC

Dates of attendance:

1967-1969

Major:

Mechanical Eng.

The University of Florida, Gainesville, FL

Dates of attendance:

1969-1976

Major:

Physics

Degree:

B.S.

Date:

1971

Major:

Physics

Degree:

Ph. D.

Date:

1976

**Professional Experience**

Dept. of Physics and Astronomy, University of Florida, Gainesville, FL.

Position:

Teaching Assistant

Dates:

1971-1975

Test and Evaluation Group, Harry Diamond Laboratories, Washington, DC.

Position:

Physicist

Date:

1973

Dosimetry Group, Center for Radiation Research

The National Institute of Standards and Technology, Gaithersburg, MD

Position:

Physicist

Dates: 1975-present

### **Honors and Awards**

NIST Measurement Services Award 1991

AAPM Farrington Daniels Award 1995

Department of Commerce Bronze Medal 1997

Department of Commerce Silver Medal 2001

### **Professional Societies**

Health Physics Society

Dates: 1982-present

American Association of Physicists  
in Medicine

Dates: 1989-present

### **Public Service**

Member, NIST Ionizing Radiation Safety Committee

Dates: 1986-present

Member, Working group revising ANSI N13.11 "Personnel Dosimetry  
Performance - Criteria for Testing"

Dates: 1987-1993

U.S. Delegate on the International Organization for Standardization,  
Technical Committee 85 (Nuclear Energy), Scientific Committee 2  
(Radiation Protection), Working Group 2 (Reference Radiations)

Dates: 1990-present

Member, Working group revising ANSI N13.37 (N545) "Performance,  
Testing, and Procedural Specifications for Thermoluminescence Dosimetry  
(Environmental Applications)" and ANSI N13.29 "Criteria for  
Testing Environmental Dosimetry Performance"

Dates: 1991-present

Member, Working group revising DOE/EH-0027, "Department of Energy  
Standard for the Performance Testing of Personnel Dosimetry Systems"

Dates: 1994-1995

Member, American Association of Physicists in Medicine (AAPM) Task  
Group 55 writing "Radiochromic Film Dosimetry Detectors:  
Recommendations of AAPM Radiation Therapy Committee Task Group 55"

Dates: 1994-1998

Member, Report committee of the International Commission on Radiation Units and Measures writing "Beta Rays for Therapeutic Applications"	
Dates:	1995-2004
Member, Working group revising ANSI N13.11 "Personnel Dosimetry Performance - Criteria for Testing"	
Dates:	1995-2002
Member, American Association of Physicists in Medicine (AAPM) Task Group 60 writing "Intravascular Brachytherapy: Recommendations of AAPM Radiation Therapy Committee Task Group 60"	
Dates:	1996-1999
Member, Data & Safety Monitoring Committee, Cardiology Research Foundation, Washington Hospital Center	
Dates:	1997-2001
Editorial Advisory Board, Vascular Radiotherapy Monitor	
Dates:	1998-2003
Member, International Atomic Energy Agency Report committee writing "Calibration of Beta-Ray and Low-Energy Photon Sources for Brachytherapy"	
Dates:	1999-2000
Editor, Cardiovascular Radiation Medicine	
Dates:	1999-2002
Member, ANSI N13 Standards Committee, "Radiation Protection"	
Dates:	2000-present
Member, American Association of Physicists in Medicine (AAPM) Radiation Therapy Committee, Subcommittee on "Intravascular Brachytherapy"	
Dates:	2000-2003
Member, Working group revising ANSI N13.32 "Performance Testing of Extremity Dosimeters "	
Dates:	2000-present
Associate Editor, Medical Physics Journal	
Dates:	2001-present
Editorial Board Member, Radiation Protection Dosimetry	
Dates:	2001-present

Member, Working group revising ANSI N42.32 "Performance Criteria for Alarming Personal Radiation Detectors for Homeland Security"  
Dates: 2002-present

Co-convener, and U.S. Delegate on the International Organization for Standardization, Technical Committee 85 (Nuclear Energy), Scientific Committee 2 (Radiation Protection), Working Group 22 (Radiation Dosimetry and Protocols in Clinical Radiation Protection)  
Dates: 2004-present

Member, National Council on Radiation Protection and Measurement Report Committee on "Uncertainties in the Measurement and Dosimetry of External Radiation Sources," SC 6-1  
Dates: 2004-present

Chairman, Working group revising ANSI N13.11 "Personnel Dosimetry Performance - Criteria for Testing"  
Dates: 2005-present

Member, National Council on Radiation Protection and Measurements  
Dates: 2005-present

**Invited Lectures (last 10 years only)**

"Ionizing Radiation for the Treatment of Heart Disease: A New Frontier for Dosimetry," NIST Physics Laboratory Colloquium, Gaithersburg, MD, February 16, 1996.

"Hot Particles for Heart Disease?!" Northern New Jersey Chapters of the American Nuclear Society and the Health Physics Society, Somerset, NJ, March 19, 1996.

"Surface and Near Surface Absorbed-Dose Measurements of Beta-Particle Emitters," University of Wisconsin, Department of Medical Physics Colloquium, Madison, WI, April 8, 1996.

"Dosimetry of Radiation for Restenosis," Scientific Meeting of the Mid-Atlantic Chapter of the American Association of Physicists in Medicine, College Park, MD, June 7, 1996.

"Calibration and Characterization of Beta-Particle Sources for Intravascular Brachytherapy," Annual Meeting of the American Association of Physicists in Medicine, Philadelphia, PA, July, 23, 1996.

"Characteristics of Scanning Densitometers for High-Resolution Readout of Radiochromic Film," Annual Meeting of the American Association of Physicists in Medicine, Philadelphia, PA, July, 25, 1996.

"Standards for Brachytherapy at NIST," National Research Council of Canada, Ionizing Radiation Section Colloquium, Ottawa, Canada, November 22, 1996.

"Standards for Brachytherapy at NIST," Physikalisch-Technische Bundesanstalt, Ionizing Radiation Division Colloquium, Braunschweig, Germany, January 23, 1997.

"Introduction to Isotopes for Radiation Therapy," Advances in Cardiovascular Radiation Therapy, Washington, DC, February 20, 1997.

"Comparison of Measurements and Calculations of Dose Distributions Around Brachytherapy Sources," Scientific Meeting of the Mid-Atlantic Chapter of the American Association of Physicists in Medicine, College Park, MD, May, 16, 1997.

"Comparison of Measured and Calculated Dosimetry of  $^{32}\text{P}$  Wire Sources for Intravascular Brachytherapy," Annual Meeting of the American Association of Physicists in Medicine, Milwaukee, WI, July, 29, 1997.

"Radiation Physics for the Clinician," Transcatheter Cardiovascular Therapeutics IX, Washington, DC, September 24, 1997.

"Dosimetry Methods and Instrumentation," Scientific Meeting of the Mid-Atlantic Chapter of the American Association of Physicists in Medicine on Clinical Electron Beams, Charlottesville, VA, October, 3, 1997.

"Overview of the NAMT/PL Brachytherapy Source Manufacturing Program," and "Approaches to Automated Calibrations of Brachytherapy Sources," NAMT/PL Workshop on Brachytherapy Source Manufacturing, NIST, October 8, 1997.

"ANSI N13.11 Revision Status," National Dosimetry Conference, Phoenix, AZ, November 7, 1997.

"Ophthalmic Applicator Calibration and the Issue of Source Uniformity," Meeting of the Nuclear Regulatory Advisory Committee on Medical Uses of Isotopes, Rockville, MD, March 1, 1998.

"An Introduction to the Physics of Gamma and Beta Radiation Sources," Advances in Cardiovascular Radiation Therapy, Washington, DC, March 8, 1998.

"Update on New Methods and Isotopes," with B.M. Coursey, Advances in Cardiovascular Radiation Therapy, Washington, DC, March 8, 1998.

"Standardization of Beta-Particle Reference Radiation Fields Used for Calibration of Extremity Dosimeters," Harshaw/Bicron User's Group Meeting, San Diego, CA, March 26, 1998.

"NIST Measurement Methods for Intravascular Brachytherapy Sources," CIRMS Workshop on Measurements & Standards for Intravascular Brachytherapy, Gaithersburg, MD, April 6, 1998.

"Design, Manufacturing and Calibration of Brachytherapy Sources," CIRMS Workshop on Measurements & Standards for Intravascular Brachytherapy, Gaithersburg, MD, April 7, 1998.

“Development of a Dosimetry Standard for Beta Reference Radiations,” CIRMS Workshop on Radiation Protection Dosimetry: New Developments in Reference Radiation Sources and Proficiency Testing, Gaithersburg, MD, September 25, 1998 .

“Use of a New Beta Secondary Standard (BSS),” CIRMS Workshop on Radiation Protection Dosimetry: New Developments in Reference Radiation Sources and Proficiency Testing, Gaithersburg, MD, September 25, 1998 .

"The Great Debate: Gamma vs. Beta Radioisotopes- Gamma Works Better," Transcatheter Cardiovascular Therapeutics X, Washington, DC, October 7, 1998.

"Dosimetry Calculations for Short and Long Beta Sources," Advances in Cardiovascular Radiation Therapy, Washington, DC, February 17, 1999.

“Development of Primary Standards and Transfer Standards at NIST,” Professional Enrichment Course, Health Physics Society Annual Meeting, Philadelphia, June 27, 1999.

“Development of a Dosimetry Standard for Beta-Particle Reference Radiation Fields,” Health Physics Society Annual Meeting, Philadelphia, July 1, 1999.

“Calibration Standards for Intravascular Applications,” American Association of Physicists in Medicine Annual Meeting, Nashville, TN, July 27, 1999.

“Dosimetry of Beta-Ray Ophthalmic Applicators: Comparison of Different Measurement Methods,” American Association of Physicists in Medicine Annual Meeting, Nashville, TN, July 27, 1999.

“Two Dimensional Radiation Field Mapping Using Radiochromic Film,” Refresher Course, American Association of Physicists in Medicine Annual Meeting, Nashville, TN, July 28, 1999.

"An Introduction to the Physics of Gamma and Beta Radiation Sources," Transcatheter Cardiovascular Therapeutics XI, Washington, DC, September 22, 1999.

“Calibration of Low-Energy Photon and Beta-Particle Emitting Brachytherapy Sources,” International Atomic Energy Agency, Vienna, November 1, 1999.

“Calibration Standards for Intravascular Applications,” Health Physics Society Mid-year Meeting, Virginia Beach, VA, Feb. 2, 2000.

"Update on Dosimetry Studies for Beta Isotopes," Advances in Cardiovascular Radiation Therapy, Washington, DC, February 16, 2000.

"Determination of AAPM TG43/60 Parameters for Photon and Beta Sources," Advances in Cardiovascular Radiation Therapy, Washington, DC, February 16, 2000.

“ANSI N13.11 Revision Update,” Panasonic User’s Group Meeting, Hershey, PA, June 7, 2000.

“Present and Future Status of Endovascular Brachytherapy: Medical Physics Equipment and Staff Requirements,” International Atomic Energy Agency, Vienna, June 21, 2000.

“Beta Particle Dosimetry of Radium Nasopharyngeal Applicators,” Health Physics Society Annual Meeting, Denver, June 27, 2000.

“Experimental Determination of the Response of GAFChromic Film to  $^{125}\text{I}$  Photons,” American Association of Physicists in Medicine Annual Meeting, Chicago, July 27, 2000.

“Calibration of Endovascular Brachytherapy Sources at NIST,” Meeting of the German Medical Physics Society Working Group 18, Berlin, Germany, September 14, 2000.

“NIST Standards for Photon and Electron Radiation Dosimetry,” American Nuclear Society International Meeting, Washington, DC, November 15, 2000.

"How Accurate Can We Get?," Advances in Cardiovascular Radiation Therapy, Washington, DC, February 5, 2001.

"Update on the Determination of AAPM TG43/60 Parameters for Photon and Beta Sources," Advances in Cardiovascular Radiation Therapy, Washington, DC, February 5, 2001.

“Comparing Methods for Verifying Source Output at Clinical Sites,” Meeting of the German Medical Physics Society Working Group 18, Vienna, Austria, March 8, 2001.

“Calibration Procedures at NIST for Low-Energy Photon Sources and Beta-Particle Sources,” International Atomic Energy Agency, Vienna, May 7, 2001.

“National and International Standards and Calibration of Thermoluminescence Dosimetry Systems,” 13<sup>th</sup> International Conference on Solid State Dosimetry, Athens, Greece, July 12, 2001.

“Calibration of a Scintillator for Use in Beta-Particle Intravascular Brachytherapy Source Measurements,” American Association of Physicists in Medicine Annual Meeting, Salt Lake City, July 23, 2001.

“Calibration of Concave Ru-106 Applicators,” Meeting of the German Medical Physics Society Working Group 18, Karlsruhe, Germany, October 11, 2001.

“Radiochromic Film Dosimetry at NIST,” Meeting of the German Medical Physics Society Working Group 18, Karlsruhe, Germany, October 12, 2001.

"Improvements in Primary Standards for Intravascular Brachytherapy" Advances in Cardiovascular Radiation Therapy, Washington, DC, February 6, 2002.

"Comparison of Methods for Dose Rate Verification in the Clinic," Advances in Cardiovascular Radiation Therapy, Washington, DC, February 6, 2002.

“Absorbed Dose Measurements of a Handheld 50-kV X-ray Source in Water with Ionization Chambers and Plastic Scintillators,” American Association of Physicists in Medicine Annual Meeting, Montreal, July 17, 2002.

“Dosimetric Issues in Vascular Brachytherapy (TG-43/60),” American Association of Physicists in Medicine 2002 Summer School, Montreal, July 19, 2002.

“Brachytherapy Dosimetry,” Physics Department Colloquium, McDaniel College, Westminster, MD, November 14, 2002.

“Source Specification and Codes of Practice,” International Atomic Energy Agency International Symposium on Standards and Codes of Practice in Medical Radiation Dosimetry, Vienna, November 27, 2002.

“The Evolution of Photon Air-Kerma to Dose Equivalent Conversion Coefficients,” Physics Department Colloquium, Idaho State University, Pocatello, ID, April 23, 2003.

“GAFChromic Film Dosimetry for Medical Applications,” Medical Physics Department Colloquium, McGill University, Montreal, Quebec, June 6, 2003.

“The divergence correction for extrapolation chambers measuring brachytherapy sources,” American Association of Physicists in Medicine Annual Meeting, San Diego, August 13, 2003.

“The Need for International Standardization in Clinical Beta Dosimetry for Brachytherapy,” International Organization for Standardization TC85/SC2 Meeting, Buenos Aires, March 31, 2004.

“AAPM Task Group 60 Update: A Recommended Dose Calculation Formalism and Consensus Dosimetry Parameters Intravascular Brachytherapy Dosimetry,” Cardiovascular Revascularization 2004, Washington, DC, May 6, 2004.

“International Standardization of Beta Brachytherapy Dosimetry,” Cardiovascular Revascularization 2004, Washington, DC, May 6, 2004.

“Radiochromic Film Dosimetry for Medical Applications,” 2<sup>nd</sup> Summer School on Solid State Dosimetry, Yale University, New Haven, CT, June 25, 2004.

“New Developments in Radiochromic Film Dosimetry for Medical Applications,” 14<sup>th</sup> International Conference on Solid State Dosimetry, Yale University, New Haven, CT, June 30, 2004.

“Absorbed Dose Measurements of a Handheld 50-kV X-ray Source in Water with Thermoluminescence Dosimeters,” 14<sup>th</sup> International Conference on Solid State Dosimetry, Yale University, New Haven, CT, June 31, 2004.

“A Segmented  $^{32}\text{P}$  Source Monte Carlo Model to Derive AAPM TG-60 Dosimetric Parameters Used for Intravascular Brachytherapy,” American Association of Physicists in Medicine Annual Meeting, Pittsburgh, August 13, 2004.

“Personal Dosimetry Performance Testing in the United States,” Individual Monitoring 2005, Vienna, April 11, 2005.

“Revision of ANSI/HPS N13.11-2001,” Panasonic User's Group Meeting, Traverse City, MI, June 10, 2005.

“History and Current Status of ANSI/HPS N13.11,” Health Physics Society Annual Meeting, Spokane, July 13, 2005.

“History and Current Status of ANSI/HPS N13.11,” CIRMS Annual Meeting, Gaithersburg, October 24, 2005.

### **University Service**

None

### **Teaching Activities**

Recitation Session, Undergraduate Physics courses, Teaching Assistant 1974-1975

### **Collaborative activities**

Publications with other **GUMC faculty or students**:

Soares, C. G., M. Ehrlich, T. N. Padikal, and **Z. C. Gromadzki**, "A System for Electron Therapy Dosimetry Surveys with Thermoluminescence Dosimeters", *Int. Journal of Applied Radiation and Isotopes*, **33**, pp. 1007-13 (1982).

C.G. Soares, **M.M. Kaufman** and J.O. Deasy, "Measurement of the Ion Diffusion Correction at Very Small Air Gaps Using a Windowless Extrapolation Chamber," *Med. Phys.* **19**, 840 (1992) (abstract).

Akselrod, M.S., S.W.S McKeever, **M. Moscovitch**, D. Emfietzoglou, J.S. Durham and C.G. Soares, "A Thin-Layer  $\text{Al}_2\text{O}_3:\text{C}$  Beta TL Detector," *Rad. Prot. Dosim.* **66**, 105-110 (1996).

**Niroomand-Rad, A.**, Blackwell, C.R., Coursey, B.M., Gall, K.P., McLaughlin, W.L., Meigooni, A.S., Nath, R., **Rodgers, J.E.**, and Soares. C.G., "Radiochromic dosimetry: recommendations of the AAPM Radiation Therapy Committee Task Group 55," *Med. Phys.* **25**, 2093-2115 (1998).

Soares, C. and **Lombardi, M.**, "Dosimetric Characteristics of a New Radiochromic Film for IMRT Dosimetry," *Med. Phys.* **31**, 1725 (2004)(abstract).

**Niroomand-Rad, A.**, Chiu-Tsao, S.T., Soares, C.G., Meigooni, A.S., and Kirov, A., "Comparison of uniformity of dose response of double layer radiochromic films (MD055-2) measured at 5 institutions," *Physica Medica* **21**, 15-40 (2005).

## **Scholarship and Research**

### **A. Research Grants**

Bureau of Radiological Health, US Dept. of Health, Education & Welfare, FDA-IAG 74-41 (0), "Nationwide Survey of Cobalt-60 Teletherapy Dosimetry," 1974-1977, Co-investigator, 50% effort, \$??K

Bureau of Radiological Health, US Dept. of Health, Education & Welfare, FDA-IAG 78-XX (0), "A Thermoluminescence Dosimetry System for Use in a Survey of High-Energy Bremsstrahlung Dosimetry," 1978-1979, Co-investigator, 50% effort, \$??K

United States Nuclear Regulatory Commission, "Quality Assurance of Radiation Measurements for Regulatory Purposes," RES-80-126, 1981-1984, 50% effort. \$180K

US Department of Energy, DE-AI01-93EH89321, "Improving Measurement Quality Assurance for Photon Irradiations at Department of Energy Facilities," 1993-1995, Principal Investigator, 50% effort, \$200K

National Advanced Manufacturing Testbed, US Dept of Commerce, "Design, Manufacture and Calibration of Radioactive Seeds and Other Radiation Sources for Radiation Therapy," 1997-2001, Principal Investigator, 50% effort, \$440K

### **B. Publications**

#### **1. Original papers in referred journals**

Soares, C. G., R. D. Lear, J. T. Sanders, and H. A. Van Rinsvelt, "K-shell X-ray Production Cross-Sections for 1.0-4.4 MeV  $\alpha$  particles on Selected Thin Targets of Z=22-34", *Physical Review A* **13**, No. 3, pp. 953-7 (1976).

Dick, C. E., C. G. Soares, and J. W. Motz, "X-Ray Scatter Data for Diagnostic Radiology", *Physics in Medicine and Biology* **23**, No. 6, pp. 1076-85 (1978).

Ehrlich, M., C. G. Soares, B. Jackson, and P. Lanoue, "Influence of Source Configuration on Spectral Composition of Gamma-Ray Beams from  $^{60}\text{Co}$  Teletherapy Units", *Int. Journal of Applied Radiation and Isotopes* **29**, pp. 741-7 (1978).

Thompson, D. L., H. O. Wyckoff and C. G. Soares, "Interim Report on the National Bureau of Standards/Bureau of Radiological Health  $^{60}\text{Co}$  Teletherapy Survey", *Int. J. Radiation Oncology Biol. Phys.* **4**, pp. 1065-1068 (1978).

Soares, C. G. and M. Ehrlich, "Concerning  $\text{Li}_2\text{B}_4\text{O}_7$  Thermoluminescence Dosimeters", *Medical Physics* **6**, No. 4, p. 312 (1979).

Soares, C. G. and M. Ehrlich, "A Thermoluminescence Dosimetry System for Use in a Survey of High-Energy Bremsstrahlung Dosimetry", *IEEE Transactions on Nuclear Science*, Vol. NS-28, No. 2, pp. 1614-20 (1981).

Soares, C. G., M. Ehrlich, T. N. Padikal, and Z. C. Gromadzki, "A System for Electron Therapy

Dosimetry Surveys with Thermoluminescence Dosimeters", *Int. Journal of Applied Radiation and Isotopes*, **33**, pp. 1007-13 (1982).

Ehrlich, M. and C. G. Soares, "Effect of Phantom Geometry on the Conversion Factor from Exposure to Absorbed Dose", *Radiation Protection Dosimetry*, **8** No. 4, pp. 261-3 (1984).

Soares, C. G., C. E. Dick, J. S. Pruitt, and J. H. Sparrow, "Development of Monoenergetic Electron Beam Sources for Radiation Instrument Calibration", *Nuclear Instruments and Methods for Physics Research B* **10/11**, pp. 937-41 (1985).

Duvall, K. C., C. G. Soares, H. T. Heaton II, and S. M. Seltzer, "The Development of a 6 to 7 MeV Photon Field for Instrument Calibration", *Nuclear Instruments and Methods for Physics Research B* **10/11**, pp. 942-5 (1985).

Soares, C. G., "Predicting Beta Particle Response of Instruments from Their Response to Monoenergetic Electrons", *Radiation Protection Dosimetry* **14**, No. 2, pp. 113-5 (1986).

Soares, C. G., E. L. Bright, and M. Ehrlich, "Difficulties Encountered with Some High-Atomic Number Personnel Dosimeters Irradiated On-Phantom with Low-Energy Photons", *Health Physics* **54**,4 pp.431-444 (1988).

Duvall, K. C., S. M. Seltzer, C. G. Soares and B. W. Rust, "Dosimetry of a Nearly Monoenergetic 6- to 7-MeV Photon Source by NaI(Tl) Scintillation Spectrometry", *Nuclear Instruments and Methods A* **272**, pp. 866-870 (1988).

Soares, C. G., B. M. Coursey, F. F. McWilliams and M. J. Scannell, "Dose Mapping of Radioactive Hot Particles Using Radiochromic Film", *Radioactivity & Radiochemistry* **1,2** pp. 14-16 (1990).

Pella, P. A. and C. G. Soares, "Secondary Target X-Ray Excitation For In-Vivo Measurement of Lead in Bone", *Advances in X-Ray Analysis* **34**, pp. 293-298 (1991).

Soares, C. G., "Calibration of Ophthalmic Applicators at NIST - A Revised Approach", *Med. Phys.* **18**, pp. 787-793 (1991).

McLaughlin, W. L., C. Yun-Dong, C. G. Soares, A. Miller, G. Van Dyk and D. F. Lewis, "Sensitometry of the Response of a New Radiochromic Film Dosimeter to Gamma Radiation and Electron Beams", *Nucl. Instrum. Methods Phys. Res. A* **302**, pp. 165-176 (1991).

McLaughlin, W. L., H. M. Khan, M. Farahani, M. L. Walker, J. M. Puhl, S. M. Seltzer, C. G. Soares and C. E. Dick, "Low-Energy Electron Dose-Distribution Measurements with Thin-Film Dosimeters", *Beta-Gamma* **4**, pp. 20-29 (1991).

Coursey, B. M., L. J. Goodman, D. D. Hoppes, R. Loevinger, W. L. McLaughlin, C. G. Soares and J. T. Weaver, "The Needs for Brachytherapy Source Calibrations in the United States," *Nucl. Instr. and Meth. A* **312**, 246-250 (1992).

Soares, C. G., P. J. Darley, M. W. Charles and J. W. Baum, "Hot Particle Dosimetry Using Extrapolation Chambers and Radiochromic Foils", *Radiat. Prot. Dosim.* **39**, 55-59 (1992).

Soares, C. G., "A Method for the Calibration of Concave  $^{90}\text{Sr}+^{90}\text{Y}$  Ophthalmic Applicators", *Phys. Med. Biol.* **37**, 1005-1007 (1992).

McWilliams, F. F., M. J. Scannell, C. G. Soares, B. M. Coursey and G. E. Chabot, "Hot Particle Dosimetry Using  $^{60}\text{Co}$  Spheres", *Radiat. Prot. Dosim.* **40**, 223-234 (1992).

Soares, C. G. and W. L. McLaughlin, "Measurement of Radial Dose Distributions Around Small Beta-Particle Emitters Using High-Resolution Radiochromic Foil Dosimetry", *Radiat. Prot. Dosim.* **47**, 367-372 (1993).

Deasy, J. O. and C. G. Soares, "Extrapolation Chamber Measurements of  $^{90}\text{Sr}+^{90}\text{Y}$  Beta-Particle Ophthalmic Applicator Dose Rates", *Med. Phys.* **21**, 91-99 (1994).

McLaughlin, W. L., C. G. Soares, J. A. Sayeg, E. C. McCullough, R. W. Kline, A. Wu and A. H. Maitz, "The Use of a Radiochromic Detector for the Determination of Gamma Knife Dose Characteristics", *Med. Phys.* **21**, 379-392 (1994).

Soares, C. G., "Comparison of NIST and Manufacturer Calibrations of  $^{90}\text{Sr}+^{90}\text{Y}$  Ophthalmic Applicators," *Med. Phys.* **22**, 1487-1493 (1995).

Akselrod, M.S., S.W.S McKeever, M. Moscovitch, D. Emfietzoglou, J.S. Durham and C.G. Soares, "A Thin-Layer  $\text{Al}_2\text{O}_3:\text{C}$  Beta TL Detector," *Rad. Prot. Dosim.* **66**, 105-110 (1996).

Soares, C.G., "Radiation: The Basics," *Vascular Radiotherapy Monitor*, **1**, 2-9 (1998).

Soares, C.G., D. Halpern and C.-K. Wang, "Calibration and Characterization of Beta-Particle Sources for Intravascular Brachytherapy", *Med. Phys.* **25**, 339-346 (1998).

Niroomand-Rad, A., Blackwell, C.R., Coursey, B.M., Gall, K.P., McLaughlin, W.L., Meigooni, A.S., Nath, R., Rodgers, J.E., and Soares, C.G., "Radiochromic dosimetry: recommendations of the AAPM Radiation Therapy Committee Task Group 55," *Med. Phys.* **25**, 2093-2115 (1998).

Nath, R., Amols, H.I., Coffey, C., Duggan, D., Jani, S., Li, Z., Schell, M., Soares, C.G., Whiting, J., Cole, R.E., Crocker, I., and Schwartz, R., "Intravascular brachytherapy physics: report of the AAPM Radiation Therapy Committee Task Group No. 60," *Med. Phys.* **26**, 119-152 (1999).

Colle, R., Zimmerman, B.E., Soares, C.G., and Coursey, B.M., "Determination of a Calibration Factor for the Non-Destructive Assay of NeoCardia  $^{32}\text{P}$  Brachytherapy Sources," *Appl. Radiat. Isot.* **50**, 835-841 (1999).

Klemic, G., Shobe, J., Sengupta, S., Shebell, P., Miller, K., Carolan, P.T., Holeman, G., Kahnhauser, H., Lamperti, P., Soares, C., Azziz, N., and Moscovitch, M., "State of the art of environmental dosimetry: 11<sup>th</sup> international intercomparison and proposed performance tests," *Rad. Prot. Dosim.*

**85**, 201-206 (1999).

Böhm, J., Alberts, W.G., Swinth, K.L., Soares, C.G., McDonald, J.C., Thompson, I.M.G., Kramer, H.-M., "ISO recommended reference radiations for the calibration and proficiency testing of dosimeters and dose-rate meters used in radiation protection", *Radiat. Prot. Dosim.* **86**, 87-105 (1999).

Bambynek, M., Flühs, D., Quast, U., Wegener, D., and Soares, C.G., "A high precision, high-resolution and fast system for beta sources applied in cardiovascular brachytherapy," *Med. Phys.* **27**, 662-667 (2000).

Mourtada, F.A., Soares, C.G., Seltzer, S.M. and Lott, S.H., "Dosimetry characterization of a  $^{32}\text{P}$  catheter-based vascular brachytherapy source wire," *Med. Phys.* **27**, 1770-1776 (2000).

de Almeida, C., DeWerd, L., Järvinen, H., Soares, C.G., "Guidelines for the calibration of low energy photon sources and beta-ray brachytherapy sources," *SSDL Newsletter* **43**, 4-25 (2000).

Soares, C.G., "Consistency standards for source strength of beta-particle sources," *Vascular Radiotherapy Monitor* **3**, No. 3, 59-63 (2001).

Soares, C.G., Vynckier, S., Järvinen, H., Cross, W.G., Hokkanen, J., Sipilä, P., Flühs, D., Schaeken, B., Mourtada, F.A., Bass, G.A., Williams, T.T., "Dosimetry of beta-ray ophthalmic applicators: Comparison of different measurement methods," *Med. Phys.* **28**, 1373-1384 (2001).

Cross, W.G., Hokkanen, J., Järvinen, H., Sipilä, P., Mourtada, F.A., Soares, C.G. and Vynckier, S., "Calculation of dose distributions from ophthalmic applicators," *Med. Phys.* **28**, 1385-1396 (2001).

Soares, C.G., "National and International Standards and Calibration of Thermoluminescence Dosimetry Systems," *Rad. Prot. Dosim.* **101**, 167-171 (2002).

Soares, C.G., "Standards for Intravascular Brachytherapy," *Cell. Mol. Biol.* **48** (5), 441-443 (2002).

Mourtada, F.A., Soares, C.G., Seltzer, S.M., Bergstrom, P. M. Jr., Fernandez-Varea, J.M., Asenjo, J., Lott, S.H., "Dosimetry Characterization for  $^{32}\text{P}$  Source Wire Used for Intravascular Brachytherapy with Automated Stepping," *Med. Phys.* **30**, 959-971 (2003).

Yukihara, E.G., Gaza, R., McKeever, S.W.S. and Soares, C.G., "Optically stimulated luminescence and thermoluminescence efficiencies for relativistic heavy charged particle irradiation in  $\text{Al}_2\text{O}_3:\text{C}$ ," *Radiat. Meas.* **38**, 59-70 (2004).

Mourtada, F.M., Soares, C.G., and Horton, J.H., "A segmented  $^{32}\text{P}$  source Monte Carlo model to derive AAPM TG-43/60 dosimetric parameters for intravascular brachytherapy," *Med. Phys.* **31**, 602-608 (2004).

Devic, S., Seuntjens, J., Hegyi, G., Podgorsak, E.B., Soares, C.G., Kirov, A.S., Ali, I., Williamson, J.F. and Elizondo, A., "Dosimetric properties of improved GafChromic films for seven different digitizers," *Med. Phys.* **31**, 2392-2401 (2004).

Devic, S., Seuntjens, J., Sham, E., Podgorsak, E.B., Kirov, A.S., Schmidlein, C.R., LoSasso, T., and Soares, C.G., "Precise radiochromic film dosimetry using a flat-bed document scanner," *Med. Phys.* **32**, 2245-2253 (2005).

Kirov, A.S., Piao, J.Z., Mathur, N.K., Miller, T.R., Devic, S., Trichter, S., Zaider, M., Soares, C.G., and LoSasso, T., "The three dimensional scintillator dosimetry method: test for a  $^{106}\text{Ru}$  eye plaque applicator," *Phys. Med. Biol.* **50**, 3063-3081 (2005).

Niroomand-Rad, A., Chiu-Tsao, S.T., Soares, C.G., Meigooni, A.S., and Kirov, A., "Comparison of uniformity of dose response of double layer radiochromic films (MD055-2) measured at 5 institutions," *Physica Medica* **21**, 15-40 (2005).

Soares, C.G., "Radiochromic Film Dosimetry," *Radiat. Meas.*, In Press.

Soares, C.G., Drupieski, C., Wingert, B., Pritchett, G., Pagonis, V., O'Brien, M., Sliski, A.P., Bilski, P. and Olko, P., "Absorbed dose measurements of a handheld 50-kV x-ray source in water with thermoluminescence dosimeters," *Rad. Prot. Dosim.*, In Press.

Soares, C.G., "New developments in radiochromic film dosimetry," *Rad. Prot. Dosim.*, In Press.

Gaza, R., Bulur, E., McKeever, S.W.S., and Soares, C.G., "Experimental determination of the dose deposition profile of a  $^{90}\text{Sr}$  beta source," *Rad. Prot. Dosim.*, In Press.

Sliski, A.P., Soares, C.G., and Mitch, M.G., "A fiber optic dosimeter for absorbed dose measurements of low energy gamma brachytherapy sources," *Rad. Prot. Dosim.*, In Press.

Soares, C.G., "Personal Dosimetry Performance Testing in the United States," *Proceedings of IM2005, Rad. Prot. Dosim.*, In Press.

Devic, S., Seuntjens, J.P.F., Abdel-Rahman, W., Evans, M., Olivares, M., Podgorsak, E.B., Vuong, T., and Soares, C.G., "Accurate skin dose measurements using radiochromic films in clinical applications," *Int. J. Rad. Oncol. Biol. Phys.*, In Press.

## **2. Reviews or editorials in referred journals**

None

## **3. Books or chapters in books, and publications in other journals**

Ehrlich, M. and C. G. Soares, "Exposure Spectra from NBS Vertical-Beam  $^{60}\text{Co}$  Gamma-Ray Source", NBSIR 76-1117 (1976).

Soares, C. G. and M. Ehrlich, "Nationwide Survey of Cobalt-60 Teletherapy Dosimetry", NBS Technical Note 978 (1978).

Ehrlich, M. and C. G. Soares, "A Thermoluminescence Dosimetry System for Use in a Survey of High-Energy Bremsstrahlung Dosimetry", NBS Technical Note 1119 (1980).

Ehrlich, M. and C. G. Soares, "Measurement Assurance Studies of High-Energy Electron and Photon Dosimetry in Radiation-Therapy Applications," Intercomparison Procedures in the Dosimetry of High-Energy X-Rays and Electron Beams, IAEA-TECDOC-249 (1981).

Soares, C. G. and M. Ehrlich, "NBS Traceability Programs for Radiation Therapy", in "Proceedings of a Meeting on Traceability for Ionizing Radiation Measurements", NBS Special Publication 609, pp. 89-97 (1982).

Ehrlich, M., F. J. Shima, and C. G. Soares, "Characterization of the Panasonic Thermoluminescence Dosimetry System", in "Quality Assurance for Measurements of Ionizing Radiation", NUREG/CR 3775, pp. A1-57 (1984).

Ehrlich, M., J. S. Pruitt, and C. G. Soares, "Standard Beta-Particle and Monoenergetic Electron Sources for the Calibration of Beta-Radiation Instrumentation", NUREG/CR-4266 and NBSIR 85-3169 (1985).

Dick, C. E., D. Polansky, C. G. Soares, and S. M. Seltzer, "Radiation Measurements on a Portable 1.5 MeV Electron Linac", NBSIR 85-3209 (1985).

Soares, C. G. and J. S. Pruitt, "Status of Beta-Particle Calibration Studies at NBS", Proceedings of the Department of Energy Workshop on Beta Measurements, PNL-SA-15004, pp. 169-173 (1987).

Soares, C. G., E. L. Bright, and M. Ehrlich, "Fricke Dosimetry in High-Energy Electron Beams", NBS Special Publication 250-4 (1987).

Pruitt, J. S., C. G. Soares and M. Ehrlich, "Calibration of Beta-Particle Radiation Instrumentation and Sources," NBS Special Publication 250-21 (1988).

Zeman, G. H., C. G. Soares and R. T. Devine, "Why Change the X-Ray Conversion Factors in ANSI N13.11?", Proceedings of the Third Conference on Radiation Protection and Dosimetry, Orlando, FL (1991).

Walker, M. L., J. M. Puhl, C. G. Soares, J. C. Humphreys, B. M. Coursey and W; L. McLaughlin, "Precision Source Profiling Techniques for Ionizing Radiation Sources", Proceedings of the RadTech 92 North America UV/EB Conference and Exposition, RadTech International North America, Northbrook, IL, pp 614-625 (1992).

Soares, C. G. and J. S. Pruitt, "Measurement Quality Assurance for Beta Particle Calibrations at NIST", Proceedings of the Workshop on Measurement Quality Assurance for Ionizing Radiation, PNL-10076 CONF 9303220, Pacific Northwest Laboratory, Richland WA, pp. 305-314 (1993).

Soares, C. G. and M. Ehrlich, "Comparison of NIST and ISO Filtered Bremsstrahlung Calibration

Beams," Proceedings of the Fourth Conference on Radiation Protection and Dosimetry, Orlando, FL, pp. 457-472 (1994).

da Silva, T. A. and C. G. Soares, "Angular Variation of the Personal Dose Equivalent,  $H_p(0.07)$ , for Beta Radiation and Nearly Monoenergetic Electrons: Preliminary Results," Proceedings of the Fourth Conference on Radiation Protection and Dosimetry, Orlando, FL, pp. 175-186 (1994).

Soares, C. G. and P. R. Martin, "A Comprehensive Set of Conversion Coefficients for Photons", Proceedings of the Harshaw User's Group Meeting, Las Vegas, NV, March 13-17, 1995.

Soares, C. G. and P. R. Martin, "A Consistent Set of Conversion Coefficients for Personnel and Environmental Dosimetry", Proceedings of the Panasonic User's Group Meeting, Somerset, PA, June 5-9, 1995.

Kaurin, D.G.L., J.W. Baum, M.W. Charles, D.P.J. Darley, J.S. Durham, M.J. Scannell and C.G. Soares, "Hot Particle Intercomparison Dosimetry", Proceedings of the 1996 International Congress on Radiation Protection, Vienna, April 14-19, 1996.

Ipe, N.E., Chatterji, S., Fasso, A., Kase, K.R., Seefred, R., Olko, P., Bilski, P. and Soares, C.G., "Low-Energy X-ray Studies (6 to 16 keV) at SSRL Beamline 1-5," SLAC-PUB-7628, Stanford Linear Accelerator Center, Stanford, CA. March 1998.

Coursey, B.M., Seltzer, S.M., Soares, C.G., and Zimmerman, B.E., "Glossary of radiation physics for vascular brachytherapy," in Handbook of Vascular Brachytherapy, ed. R. Waksman and P.W. Serruys, Martin Dunitz, London., pp. 5-10 (1998).

Klemic, G., Shobe, J., Sengupta, S., Lamperti, P., Soares, C., Shebell, P., Monetti, M. and Raccah, F., "Pilot Test of ANSI Draft Standard N13.29 Environmental Dosimetry – Performance Criteria for Testing," Report EML-598, Environmental Measurements Lab., New York (1998).

Soares, C.G., "Dosimetry of Sealed Beta-Particle Sources," in Vascular Brachytherapy, Second Edition, ed. R. Waksman, Futura, Armonk, NY, pp149-166 (1998).

Soares, C.G., "Dosimetry of Sealed Beta-Particle Sources," in Vascular Brachytherapy, Third Edition, ed. R. Waksman, Futura, Armonk, NY, pp. 197-212 (2002)

Soares, C.G., "Dosimetric Issues in Vascular Brachytherapy (TG-43/60)," in Intravascular Brachytherapy/ Fluoroscopically Guided Interventions, ed. S. Balter, R. C. Chan and T.B. Shope, Jr., Medical Physics Monograph No. 28 (AAPM 2002 Summer School Proceedings), Medical Physics Publishing, Madison, WI, pp. 321-372 (2002).

Soares, C.G. and Toelli, H., "Source specification and codes of practice for brachytherapy dosimetry," in Standards and Codes of Practice in Medical Radiation Dosimetry, Proceedings of an International Symposium, Vienna, 25-28 November 2002, International Atomic Energy Agency, Vienna, pp. 79-92 (2003).

Selbach, H.-J. and Soares, C.G., "New developments on primary standards for brachytherapy at NIST (US) and PTB (Germany)," in Standards and Codes of Practice in Medical Radiobiology Dosimetry, Proceedings of an International Symposium, Vienna, 25-28 November 2002, International Atomic Energy Agency, Vienna, pp. 101-110 (2003).

Ambrosi, P., Behrens, R., Böhm, J., and Soares, C.G., "Calibration and proficiency testing of dosimeters – recent developments in ISO and IEC standards," Procedures of IRPA 11 (2004).

Soares, C.G., "Calibration of ophthalmic applicators," NIST Quality Manual, Ionizing Radiation Division QM-II, Procedure 9  
<http://physics.nist.gov/Divisions/Div846/QualMan/Procedures/WebProcedure09v200.pdf> (2004).

Soares, C.G., "Protection-level beta-particle calibrations," NIST Quality Manual, Ionizing Radiation Division QM-II, Procedure 10  
<http://physics.nist.gov/Divisions/Div846/QualMan/Procedures/WebProcedure10v200.pdf> (2004).

#### **4. Abstracts**

J.O. Deasy and C.G. Soares, "Extrapolation Chambers as applied to Ophthalmic Applicators," Med. Phys. 17, 533 (1990).

J.O. Deasy and C.G. Soares, "Free Electron Diffusion Losses in Air Filled Parallel Plate Ionization Chambers at Small Electrode Separations," Med. Phys. 17, 553 (1990).

C.G. Soares, "Comparison of Extrapolation Chamber and Radiochromic Foil Techniques for the Calibration of Ophthalmic Applicators," Med. Phys. 18, 596 (1991).

W.L. McLaughlin, C.G. Soares, J.A. Sayeg, E.C. McCullough, R.W. Kline, A. Wu and A.H. Maitz, "Dose Characteristics from the Gamma Knife Using GafChromic Detectors," Med. Phys. 18, 603 (1991).

C. G. Soares, "A Method for the Calibration of Concave Ophthalmic Applicators," Med. Phys. 18, 644 (1991).

W.L. McLaughlin, C.G. Soares, J.A. Sayeg, E.C. McCullough, R.W. Kline, A. Wu and A.H. Maitz, "Dosimetry and Field Characteristics of Gamma-ray Stereotactic Radiosurgery Units using Radiochromic Films," Med. Phys. 19, 791 (1992).

C.G. Soares, M.M. Kaufman and J.O. Deasy, "Measurement of the Ion Diffusion Correction at Very Small Air Gaps Using a Windowless Extrapolation Chamber," Med. Phys. 19, 840 (1992).

C.G. Soares, "Comparison of NIST and Manufacturer Calibrations of  $^{90}\text{Sr}+^{90}\text{Y}$  Ophthalmic Applicators," Med. Phys. 21, 899 (1994).

I.J. Das, G.E. Desobry and C.G. Soares, "Backscatter dose perturbations with a small high Z inhomogeneity in kilovoltage beams," Med. Phys. 22, 965 (1995).

C.G. Soares, D. Halpern and C.-K. Wang, "Calibration and Characterization of Beta-Particle Brachytherapy Sources for Intravascular Brachytherapy," Med. Phys. 23, 1081 (1996).

C.G. Soares, "Characteristics of Scanning Densitometers for High-Resolution Readout of Radiochromic Film," Med. Phys. 23, 1123 (1996).

C.G. Soares, S.M. Seltzer and K.K. Mather, "Comparison of Measured and Calculated Dosimetry of  $^{32}\text{P}$  Wire Sources for Intravascular Brachytherapy," Med. Phys. 24, 994 (1997).

R. Chan, C.G. Soares and S.-T. Chiu-Tsao, "GafChromic Film Dosimetry of  $^{192}\text{Ir}$  Seeds at Distances Close to the Source," Med. Phys. 24, 1019 (1997).

F. Mourtada, B. Coursey, L. Karam, S. Seltzer, C. Soares, M. Unterweger and B. Zimmerman, "A Comparison Study of Film Measurements with Monte Carlo Calculations of Y-90, Re-188, Tc-99m, Liquid- and Xe-133 Gas-Filled Balloon Catheters for Use in Intravascular Brachytherapy," Med. Phys. 25, A108 (1998).

C. Soares, B. Coursey, S. Seltzer, T. Wheatley, R. Norcross, F. Mourtada and M. Mitch, "An Automated Calibration Facility for Brachytherapy Sources," Med. Phys. 25, A121 (1998).

S. Seltzer, P. Lamperti, R. Loevinger and C. Soares, "New NIST Air-Kerma-Strength Standards for  $^{125}\text{I}$  and  $^{103}\text{Pd}$  Brachytherapy Seeds," Med. Phys. 25, A170 (1998).

A. Noroomand-Rad, S. Chiu-Tsao, C. Soares, A. Meighooni and A. Kirov, "Comparison of Uniformity of Dose Response of Double-Layer Radiochromic Films (MD-55-2) Measured at 5 Institutions," Med. Phys. 25, A178 (1998).

C. Soares, S. Vynckier, H. Jarvinen, W. Cross, J. Hokkanen, P. Sipil, D. Fluehs, B. Schaeken, F. Mourtada, G. Bass and T. Williams, "Dosimetry of Beta-ray Ophthalmic Applicators: Comparison of Different Measurement Methods," Med. Phys. 26, 1078 (1999).

B. Coursey, C. Soares, L. DeWerd, J. Shobe and T. Heaton, "CIRMS Measurements for Radiation Therapy Applications," Med. Phys. 26, 1080 (1999).

A. Noroomand-Rad and C. G. Soares, "Two Dimensional Radiation Field Mapping using Radiochromic Film," Med. Phys. 26, 1093 (1999).

W.G. Cross, J. Hokkanen, H. Jarvinen, F. Mourtada, P. Sipil, C. Soares and S. Vynckier, "Calculation of Beta-ray Dose Distributions from Ophthalmic Applicators," Med. Phys. 26, 1141 (1999).

C. Soares, "Calibration of a Scintillator for Use in Beta-Particle Intravascular Brachytherapy Source Measurements," Med. Phys. 28, 1238 (2001).

C. Soares and F. Mourtada, "Dosimetry Characterization of a 20mm  $^{32}\text{P}$  Source Wire for Use in Vascular Brachytherapy," Med. Phys. 29, 1225 (2002).

C. Soares and A. Sliski, "Absorbed Dose Measurements of a Handheld 50-kV X-Ray Source in Water with Ionization Chambers and Plastic Scintillators," *Med. Phys.* 29, 1351 (2002).

S. Chiu-Tsao, T. Duckworth, C. Zhang, C. Soares, A. Sliski, Y. Ho, and L. Harrison, "Evidence with Ultra-High Resolution Film Dosimetry of Dose Enhancement Due to Backscattered Sr-90 Beta Radiation from a Stent," *Med. Phys.* 30, 1387 (2003).

C. Soares and P. Bergstrom, "The Divergence Correction for Extrapolation Chambers Measuring Brachytherapy Sources," *Med. Phys.* 30, 1427 (2003).

C. Soares and M. Lombardi, "Dosimetric Characteristics of a New Radiochromic Film for IMRT Dosimetry," *Med. Phys.* 31, 1725 (2004).

R. Nath, S. Chiu-Tsao, D. Schaart and C. Soares, "Recommended Dose Calculation Formalism and Consensus Dosimetry Parameters for Intravascular Brachytherapy Dosimetry," *Med. Phys.* 31, 1744 (2004).

F. Mourtada, C. Soares and J. Horton, "A Segmented <sup>32</sup>P Source Monte Carlo Model to Derive AAPM TG-60 Dosimetric Parameters Used for Intravascular Brachytherapy," *Med. Phys.* 31, 1745 (2004).

S. Devic, C. Soares and J. Seuntjens, "Absorption Spectra of Improved GafChromic Film Types," *Med. Phys.* 31, 1837 (2004).

R. Hearn, C.G. Soares, J. Bergman, K. Millage, M. Napolitano and J. Rodgers, "Radiological Characterization of a <sup>103</sup>Pd Ocular Brachytherapy Source," *Med. Phys.* 31, 1914 (2004).

A. Sliski, M. Mitch, and C. Soares, "Development of a New Fiber Optic Scintillator Dosimeter System," *Med. Phys.* 32, 2137 (2005).

S. Devic, W. Abdel-Rahman, J. Seuntjens, E. Podgorsak, T. Vuong, and C. Soares, "Skin Dose Measurement with Radiochromic Film," *Med. Phys.* 32, 2061 (2005).

A.S. Kirov, J.Z. Piao, N. Mathur, T.R. Miller, S. Devic, S. Trichter, M. Zaider, T. LoSasso, and C. Soares, "A Test of the 3D Scintillation Dosimetry Method for a Ru-106 Eye Plaque Applicator," *Med. Phys.* 32, 2002 (2005)

## **Contributions to the Field of Ionizing Radiation Dosimetry**

Performed the first calibrations of beta-particle intravascular brachytherapy sources allowing this fledgling field to gain FDA acceptance. Acknowledged world expert in the calibration of beta-particle ophthalmic applicators. Author of ISO standard on protection-level beta particle reference radiation field dosimetry. Co-author of IAEA and ICRU reports on dosimetry of medical applications of beta-particle and low-energy photon sources. Member of NCRP SC 6-1 on dosimetry uncertainties. Long-time contributor to the development of performance test standards for personnel dosimeters. Co-author of AAPM TG reports on radiochromic film dosimetry and intravascular brachytherapy. Active researcher in dosimetry of low-energy photon sources with the aim of developing absorbed dose based standards.

## **Other Special Skills**

Adept at computer programming in the BASIC and FORTRAN languages, some experience in programming in PASCAL and in assembly language. Experience with programming in Visual Basic and Visual Basic Applications language for Excel and Word. Experienced in measurement automation and control of electrometers, digital multimeters, power supplies, stepping motors, thermometers and barometers using digital logic, RS232 and IEEE488 communication protocols. Effective public speaker having delivered over 100 talks, seminars and lectures. Widely published with more than 70 peer reviewed articles and three book chapters. Have teaching experience in graduate school and have guided several graduate students and served on thesis committees at Georgetown University, the University of Michigan and the Technical University of Delft. Experience in writing research proposals and guiding sponsored research to successful completion. Trained and experienced auditor of radiation facilities and measurement procedures, with special emphasis on Quality System development for compliance with ISO 9000, ANSI Z540-1-1994 and ISO 17025. Hands-on experience in the following radiation measurement technologies: conventional radiography, photon spectrometry, thermoluminescence (TL) dosimetry, beta-particle spectrometry, extrapolation chamber dosimetry, conventional ion chamber dosimetry, electret ion chamber dosimetry, scintillator dosimetry and radiochromic film dosimetry. Have experience operating positive and negative ion Van de Graaff accelerators, x-ray generators, and clinical accelerators. Have experience in calibrations of beta particle sources, including ophthalmic applicators, protection level sources, "hot particles" and brachytherapy sources. Have experience managing and conducting mailed measurement assurance systems employing TL and Fricke dosimeters.