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Licensing Assistant Section  
Nuclear Materials Safety Branch  
U.S. Nuclear Regulatory Commission, Region I  
475 Allendale Road  
King of Prussia, PA 19406-1415

March 26, 2005

RE: Lic. No. 37-09463-01 03003115

Please add Ed Brandner, PhD, as an authorized physicist for HDR under our license:

His credentials have been reviewed and approved by our Radiation Safety Committee for him to be added to our license.

Enclosed is documentation in support of this request.  
These include documentation

1. that he has an advanced degree in a physical science
2. that he has completed one year of full time training in Radiotherapy physics and an additional year of full time work experience under the supervision of a Radiotherapy physicist at a medical institution that includes the tasks listed in Secs. 35.59, 35.632, 35.634, and 35.641 of 10CFR35
3. that he has also had training under authorized users and authorized physicists in HDR

We would appreciate having this amendment expedited as we are in transition with our physicists.

If there are any questions, please contact our Radiation Safety Officer, Andrew G. Bukovitz, at 724-543-8669.

Sincerely,

Lou Scuillo  
Chief Operating Officer



# UPMC Cancer Center

*at the Arnold Palmer Pavilion*

UPMC Cancer Center  
Arnold Palmer Pavilion  
2000 Village Drive  
Greensburg, PA 15601  
724-838-5660  
Fax: 724-838-5670

March 10, 2005

Andrew Buckovitz  
Radiation Safety Officer  
Latrobe Area Hospital

Dear Andy,

I am writing this letter to provide you with more information regarding my training in medical physics. My didactic training was taught by a team of medical physicists at the University of Pittsburgh Medical Centers and included a lecture series on radiobiology taught by Dr. Peck-Sun Lin of Virginia Commonwealth University/Medical College of Virginia. The course material was largely drawn from Kahn's book—*The Physics of Radiation Therapy* 3<sup>rd</sup> edition, and all of the major topics in Kahn's book were covered. The course topical outline is enclosed. The lectures for each topic were at least 2 hours long for a total of more than 56 hours of lectures. Also enclosed is a syllabus of the course.

In addition, to the above course, I have had training provided by Nucletron on HDR use and procedures. At the annual AAPM meeting in Pittsburgh (July, 2004), Nucletron sponsored a lecture/luncheon on the safe use of HDR emphasizing HDR safety and prostate HDR planning. At the AAPM meeting, I also attended several educational courses for which I have enclosed a copy of the certificate of medical physics continuing education credits. I also took a course on breast brachytherapy (Mammosite), and a copy of the certificate is enclosed.

I regularly assist with HDR QA, planning, and treatment at Latrobe Area Hospital using the Nucletron-Plato system. Target sites include vagina (VagCuff), bronchia (endobronchial), and prostate. Over the past 8 months, 2-4 procedures were typically performed per month in which I assisted.

Sincerely,

Edward D. Brandner, Ph.D.  
UPMC Cancer Centers  
Arnold Palmer Pavilion  
Department of Radiation Oncology





# UPMC Cancer Center

*at the Arnold Palmer Pavilion*

UPMC Cancer Center  
Arnold Palmer Pavilion  
2000 Village Drive  
Greensburg, PA 15601  
724-838-5660  
Fax: 724-838-5670

March 10, 2005

To Whom It May Concern:

I am writing this letter to request that I be given the status of an authorized medical physicist for Ir-192 Brachytherapy remote afterloaders. I have satisfactorily completed one year of training in therapeutic radiological physics and simultaneously one year of clinical work experience. Under the supervision of authorized medical physicists, I have experience in performing QA on the Ir-192 remote afterloader and planning and delivering treatments including "Y" applicator plans, "Vaginal Cylinder" plans, multiple needle prostate plans, "Mammosite" plans, and "Ring and Tandem" plans. The planning was done on Nucletron's Plato planning system using either the classical version or version 14.2.

I have also been trained in shipping and receiving sources. I have radiation safety training. I also took a breast brachytherapy training course. Enclosed also find certificates of continuing education following the 2004 AAPM meeting and Varis 7.0 training.

Enclosed, please find a letter of recommendation from Raj Selvaraj, Certified Senior Medical Physicist; a certificate of my Mammosite training; a certificate of my radiation safety training, my brief curriculum vitae, and certification of my training for the operation and safety of the remote afterloader.

Sincerely,

A handwritten signature in black ink, appearing to read "Edward D. Brandner".

Edward D. Brandner, Ph.D.  
UPMC Cancer Centers  
Arnold Palmer Pavilion  
Department of Radiation Oncology



# UPMC Cancer Center

*at UPMC Arnold Palmer Pavilion*

UPMC Cancer Center  
Arnold Palmer Pavilion  
2000 Village Drive  
Greensburg, PA 15601  
724-838-5660  
Fax: 724-838-5660

March 9, 2005

Mr. Andy Bukovitz  
Radiation Safety Officer  
Latrobe Area Hospital

Edward Brandner, Ph.D., has been working at Arnold Palmer Pavilion as a fulltime medical physicist since March 2004. Since joining he has been participating in HDR QA and treatment planning using the Nucletron PLAO system. He received training on different procedures, especially on vaginal cuff, endobronchial and prostate treatments.

If you have any additional questions regarding his HDR experience please contact me at (724) 838-5660.

Sincerely,

A handwritten signature in cursive script that reads 'Satya R. Bose'.

Satya R. Bose, PhD, Physicist  
UPMC Cancer Center  
Department of Radiation Oncology  
Medical Physics Division

*1790 TT - check up*



# UPMC Cancer Center

at UPMC Passavant

UPMC Passavant  
9100 Babcock Boulevard  
Pittsburgh, PA 15237  
412-367-6454  
Fax: 412-367-6913

March 10, 2005

UPMC Passavant Cranberry  
51. Francis Way  
Cranberry Township, PA 1604  
724-772-5380  
Fax: 724-772-5386

To Whom It May Concern:

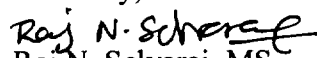
I am writing this letter on behalf of Edward D. Brandner, Ph.D. who is seeking authorized medical physicist status for Ir-192 Brachytherapy remote afterloaders. I certify that Edward D. Brandner has satisfactorily completed one year of training in therapeutic radiological physics and simultaneously one year of clinical work experience. He has completed this work under my supervision and the supervision of other certified medical physicists at the UPMC Cancer Centers. His experience includes:

- brachytherapy source (Ir-192) leak tests,
- brachytherapy source (Ir-192 and I-125) decay measurements and calculations,
- remote afterloader output (Ir-192) measurements, position measurements, retraction by battery backup, transfer tube and applicator checks, timer accuracy and linearity, indicator lights, viewing and intercom systems, electrical and mechanical stops, treatment room doors, emergency response equipment,
- radiation safety training (Ir-192 remote afterloader, linear accelerator, and I-125 seeds) and radiation surveys,
- remote afterloader source (Ir-192) exchange and training.

This training and experience covers that required by the NRC in accordance with 10CFR section 35.51 including sections 35.67, 35.632, 35.633, 35.642, 35.643, and 35.652.

Edward D. Brandner has assisted in the planning and delivery of "Y" applicator plans, "Vaginal Cylinder" plans, multiple needle prostate plans, and "Ring and Tandem" plans. The planning was done on Nucletron's Plato planning system using either the classical version or version 14.2.

Sincerely,

  
Raj N. Selvaraj, MS

UPMC Cancer Centers  
Certified Senior Medical Physicist  
Clinical Assistant Professor  
Department of Radiation Oncology  
Medical Physics Division



**TRAINING AND EXPERIENCE AND PRECEPTOR STATEMENT**

**PART I -- TRAINING AND EXPERIENCE**

**Note:** Descriptions of training and experience must contain sufficient detail to match the training and experience criteria in the applicable regulations.

1. Name of Individual, Proposed Authorization (e.g., Radiation Safety Officer), and Applicable Training Requirements (e.g., 10 CFR 35.50)

Edward D Brandner

2. For Physicians, Podiatrists, Dentists, Pharmacists -- State or Territory Where Licensed

**3. CERTIFICATION**

Specialty Board	Category	Month and Year Certified

**Stop here when using Board Certification to meet 10 CFR Part 35 training and experience requirements.**

**4. DIDACTIC OR CLASSROOM AND LABORATORY TRAINING (optional for Medical Physicists)**

Description of Training	Location	Clock Hours	Dates of Training
Radiation Physics and Instrumentation	UPMC	14	9/8/03 - 1/12/04
Radiation Protection	University of Pittsburgh Medical Centers (UPMC)	6	12/22/04 9/17/03 March, 2003
Mathematics Pertaining to the Use and Measurement of Radioactivity	UPMC	22	10/15/03 - 01/05/04
Radiation Biology	UPMC	50	9/22/03 - 9/26/03 3/24/03 3/28/03
Chemistry of Byproduct Material for Medical Use			
OTHER	UPMC	8	9/8/03 - 2/16/04

TRAINING AND EXPERIENCE AND PRECEPTOR STATEMENT (continued)

5a. WORK EXPERIENCE WITH RADIATION

Description of Experience	Name of Supervising Individual(s)	Location and Corresponding Materials License Number	Dates and Clock Hours of Experience
Planning, linac + HDR QA, chart checks	Raj Selvaraj, Satya Bose, Issa Fitian, Hank Chen, Andrew Wu	UPMC	March 2003 - March 2004 (2000)
Planning, linac + HDR QA, chart checks	Cheng Saw, Satya Bose	UPMC	November 2003 - Present (2400)

5b. SUPERVISED CLINICAL CASE EXPERIENCE

Radionuclide	Type of Use	No. of Cases Involving Personal Participation	Name of Supervising Individual	Location and Corresponding Materials License Number	Dates and Clock Hours of Experience
Ir-192	HDR	30	Raj Selvaraj, Satya Bose	UPMC	70
I-125	Prostate seed	2	Krishna Kamandari	UPMC	6

TRAINING AND EXPERIENCE AND PRECEPTOR STATEMENT (continued)

6. FORMAL TRAINING (applies to Medical Physicists and Therapy Physicians)

Degree, Area of Study or Residency Program	Name of Program and Location with Corresponding Materials License Number	Dates	Name of Organization that Approved the Program (e.g., Accreditation Council for Graduate Medical Education) and the Applicable Regulation (e.g., 10 CFR 35.490)

7. RADIATION SAFETY OFFICER -- ONE-YEAR FULL-TIME WORK EXPERIENCE

- YES Completed 1-year of full-time radiation safety experience (in areas identified in item 5a) under supervision of \_\_\_\_\_ the RSO for License No. \_\_\_\_\_
- N/A

8. MEDICAL PHYSICIST -- ONE-YEAR FULL-TIME TRAINING/WORK EXPERIENCE

- YES Completed 1-year of full-time training in therapeutic radiological physics under the supervision of \_\_\_\_\_ who meets requirements for Authorized Medical Physicists; and
- N/A
- YES Completed 1-year of full-time work experience (for areas identified in item 5a) for 35.51 (b)(1) modality(ies) under the supervision of SATYA R BOSE who meets requirements of Authorized Medical Physicists for HDR modality(ies).
- N/A

9. SUPERVISING INDIVIDUAL -- IDENTIFICATION AND QUALIFICATIONS

The training and experience indicated above was obtained under the supervision of (if more than one supervising individual is needed to meet requirements in 10 CFR 35, provide the following information for each):

A. Name of Supervisor

SATYA R BOSE PHD

B. Supervisor is:

Authorized User

Radiation Safety Officer

Authorized Medical Physicist

Authorized Nuclear Pharmacist

C. Supervisor meets requirements of Part 35, Section(s) 35.961

for medical uses in Part 35, Section(s) 35.600 ; 35.400

D. Address

SATYA R BOSE PHD  
Larrobe Area Hospital  
121 W. Second Ave  
Larrobe, PA 15650

E. Materials License Number

37-09463-01



APPENDIX B

NRC FORM 313A  
(10-2002)

U.S. NUCLEAR REGULATORY COMMISSION

TRAINING AND EXPERIENCE AND PRECEPTOR STATEMENT (continued)

PART II -- PRECEPTOR STATEMENT

Note: This part must be completed by the individual's preceptor. If more than one preceptor is necessary to document experience, obtain a separate preceptor statement from each. This part is not required to meet the training requirements in 10 CFR 35.590.

Item 10 must be completed for Nuclear Pharmacists meeting the requirements of 10 CFR Part 35, Subpart J. Preceptors do not have to complete items 11a, 11b, or the certifying statements for other individuals meeting the requirements of 10 CFR Part 35, Subpart J.

YES 10. The individual named in Item 1 has satisfactorily completed the training requirements in  
 N/A 10 CFR 35.980 and is competent to independently operate a nuclear pharmacy.

YES 11a. The individual named in Item 1 has satisfactorily completed the requirements in Part 35, Section(s)  
 N/A and Paragraph(s) 35.51, 35.67, 35.632, 35.633, 35.642, 35.643, 35.652

YES 11b. The individual named in Item 1. is competent to independently function as an authorized  
 N/A Medical Physicist for HDR uses.

12. PRECEPTOR APPROVAL AND CERTIFICATION

I certify the approval of item 10 and certify I am an Authorized Nuclear Pharmacist;

or

I certify the approval of items 11a and 11b and certify I am an Authorized Nuclear Pharmacist;

or

I certify the approval of Items 11a and 11b, and I certify that I meet the requirements of 35.961  
or equivalent Agreement State requirements to be a preceptor authorized Medical Physicist  
for the following uses of byproduct material: HDR (IR-192)

A. Address  
9100 Babcock Blvd  
Pittsburgh, PA 15237

B. Materials License Number

C. NAME OF PRECEPTOR (print clearly)  
RAJ N. SELVARAJ

D. SIGNATURE -- PRECEPTOR  
Raj N. Selvaraj

E. DATE  
3-10-05

TRAINING AND EXPERIENCE AND PRECEPTOR STATEMENT (continued)

PART II -- PRECEPTOR STATEMENT

**Note:** This part must be completed by the individual's preceptor. If more than one preceptor is necessary to document experience, obtain a separate preceptor statement from each. This part is not required to meet the training requirements in 10 CFR 35.590.

Item 10 must be completed for Nuclear Pharmacists meeting the requirements of 10 CFR Part 35, Subpart J. Preceptors do not have to complete items 11a, 11b, or the certifying statements for other individuals meeting the requirements of 10 CFR Part 35, Subpart J.

YES      10. The individual named in item 1 has satisfactorily completed the training requirements in  
 N/A      10 CFR 35.980 and is competent to independently operate a nuclear pharmacy.

YES      11a. The individual named in Item 1 has satisfactorily completed the requirements in Part 35, Section(s)  
 N/A      and Paragraph(s) 35.51(6)(1)

YES      11b. The individual named in Item 1. is competent to independently function as an authorized  
 N/A      Medical Physics for Limited HDR uses (or units).  
*Per memo attached*

12. PRECEPTOR APPROVAL AND CERTIFICATION

I certify the approval of item 10 and certify I am an Authorized Nuclear Pharmacist;

or

I certify the approval of items 11a and 11b, and certify I am an Authorized Nuclear Pharmacist;

or

I certify the approval of Items 11a and 11b, and I certify that I meet the requirements of 35.961  
or equivalent Agreement State requirements to be a preceptor authorized Medical Physics  
for the following uses (or units) of byproduct material: 35.600 ; 35.400

A. Address

SATYA R BOSE PhD  
Latrobe Area Hospital  
Department of Radiation Oncology  
121 W. 2nd Ave.  
LATROBE, PA 15650

B. Materials License Number

37-09463-01

C. NAME OF PRECEPTOR (print clearly)

SATYA R BOSE

D. SIGNATURE (PRECEPTOR)

*Satyaraj Bose*

E. DATE

3/9/05

# RADIATION ONCOLOGY RESIDENCY

## Physics Lecture Series - 2003/2004

DATE	TIME	LOCATION	INSTRUCTOR	TITLE
09/08/03	4:00 PM	Shadyside	Bruce Libby	Structure of Matter
09/15/03	4:00 PM	Shadyside	Bruce Libby	Nuclear Transformations
09/22/03	1:00 PM	Shadyside	Peck-Sun Lin	Basics of Radiobiology
09/23/03	8:00 AM	Shadyside	Peck-Sun Lin	Basics of Radiobiology
09/24/03	8:00 AM	Shadyside	Peck-Sun Lin	Basics of Radiobiology
09/25/03	8:00 AM	Shadyside	Peck-Sun Lin	Basics of Radiobiology
09/26/03	8:00 AM	Shadyside	Peck-Sun Lin	Basics of Radiobiology
09/29/03	4:00 PM	Shadyside	Bruce Libby	Production of X-rays
10/13/03	4:00 PM	Shadyside	Bruce Libby	Interactions of X and Gamma Radiations
Wed. 10/15	4:00 PM	Shadyside	Raj Selvaraj	Dose Distribution and Scatter Analysis
10/20/03	4:30 PM	Magee	Raj Selvaraj	A System of Dosimetric Calculations
10/27/03	4:30 PM	Magee	Raj Selvaraj	Treatment planning: Isodose Distribution I
11/03/03	4:30 PM	Magee	Issa Fitian	Measurement of Ionizing Radiation
11/10/03	4:30 PM	Magee	Raj Selvaraj	Treatment planning: Isodose Distribution II
11/17/03	4:30 PM	Magee	Issa Fitian	Measurement & Calculation of Absorbed Dose I
11/24/03	4:30 PM	Magee	Raj Selvaraj	Treatment planning: Isodose Distribution III
12/04/03	4:30 PM	Magee	Issa Fitian	Measurement & Calculation of Absorbed Dose II
12/08/03	4:30 PM	Magee	Will Reilly	Treatment planning: Field Shaping, Skin Dose & Field Separation
12/15/03	4:00 PM	Magee	Satya Bose	Brachytherapy I
12/22/03	4:00 PM	Shadyside	Gwen Myron	Radiation Protection
12/29/03	4:30 PM	Magee	Satya Bose	Brachytherapy I
01/05/04	4:30 PM	Shadyside	Bob Surgent	Electron Beam Therapy I
01/12/04	4:30 PM	Shadyside	Bob Surgent	Electron Beam Therapy II
01/19/04	4:00 PM	Shadyside	Hank Chen	Intensity Modulated Radiotherapy
01/26/04	4:00 PM	Magee	Satya Bose	Brachytherapy II
02/02/04	4:00 PM	Shadyside	Will Reilly	Biological Models
02/09/04	4:30 PM	Magee	Ann Maitz	Stereotactic Radiosurgery- Gamma Knife
02/16/04	4:00 PM	Shadyside	Cihat Ozhasoglu	Stereotactic Radiosurgery- Cyber Knife

## **Basic Radiation Physics**

### **1. Atomic, Nuclear Structure, Radioactivity and Decay**

#### **A. The atom**

- Protons, Neutrons, Electrons (charge, rest mass)
- Atomic Number and Atomic Mass
- Orbital electron shells (binding energy, transitions)

#### **B. Wave and quantum models of radiation**

- Energy and wavelength, energy spectrum

#### **C. Radioactivity and decay**

- Decay processes
- Probability and decay constant
- Activity, half-life, mean life
- Radioactive series
- Parent-daughter relationships and equilibrium
- Modes of radioactive decay
  - $\alpha$ -particle decay
  - $\beta$ -particle decay
  - Electron capture
  - Internal conversion

### **2. Production of radiation**

#### **A. Physics concepts of beam production**

##### X-Ray tube design

- Concept of Bremsstrahlung
- Characteristic radiation
- X-ray Energy spectrum
- Operating characteristics of X-ray tube

### **3. Interaction of Radiation with matter**

#### **A. Attenuation of Photon Beams**

- Attenuation, energy transfer, and energy absorption
- Exponential attenuation equation
- Attenuation coefficients
- Half-value layer
- Beam geometry

#### **B. Interactions of $x$ and $\gamma$ rays with matter**

- Scatter vs absorption
- Coherent scatter
- Photoelectric effect
- Compton effect
- Pair production
- Photonuclear disintegration

#### **C. Interactions of particulate radiation**

- Directly and indirectly ionizing particles
- Elastic and inelastic collisions with orbital electrons and the nucleus

- Linear energy transfer, specific ionization, mass stopping power, range
- Interactions of electrons
- Interactions of heavy charged particles
- Interactions of neutrons

#### **4. Radiation Beam Quality And Dose**

##### **A. Monoenergetic and Heterogeneous beams**

- Energy spectra for bremsstrahlung beams
- Half-value layer
- Effects of electron energy, filtration, beam geometry
- Effective energy

##### **B. Dose quantities and units**

- Exposure
- kerma
- Absorbed dose
- Dose equivalent
- RBE dose
- Calculation of absorbed dose from exposure
- Absorbed dose to any medium
- Bragg-Gray cavity theory
- Stopping powers

#### **5. Measurements of radiation/Radiation Detectors**

##### **A. Ionization Chamber/Electrometer**

- Free-air ionization chamber
- Thimble chambers
  - Farmer chambers
- Extrapolation/parallel-plate chambers
- Ion collection characteristics (saturation, collection efficiency, polarity correction and environmental conditions)
- Electrometers

##### **B. Protection Equipment and Surveys**

- a) Operating Principles of Gas-filled Detectors
- b) Operating Characteristics
- c) Radiation Monitoring Equipment
  1. Ionization chamber (Cutie Pie)
  2. Geiger-Mueller Counters
  3. Neutron Detectors

##### **C. Other Methods of Measuring Absorbed Dose**

1. Solid State Detectors
  - TLDS
  - Diode detectors
  - FET detectors
  - Diamond detectors
  - Scintillation detectors

- 2. Film Dosimetry
  - XV2 film
  - EDR2 film
  - Radiochromic film

## **6. Principles of operations of Treatment machines/simulators**

### **A. Linear accelerators**

- Operational theory of wave-guides
- Standing wave guides
- Traveling wave guides
  - Magnetron
  - Klystron
  - Electron beam
- Bending magnet systems
- Target
- Primary and secondary collimators
- Flattening filters
- Electron scattering foils
- Monitor chamber
- Electron cones
- Beam uniformity
- Dose rate
- Beam energy
- Entrance dose
- Depth of maximum dose

### **B. Collimation systems**

- Coupled and independent jaws (including virtual wedges)
- Multileaf collimators
- Other collimation systems (e.g., stereotactic systems)
- Radiation and light fields (including field size definition)
- Mechanical and operational features

### **C. Cyclotron**

### **D. Microtron**

### **E. Cobalt units**

### **F. Therapeutic x-ray (<300 kVp)**

### **G. Simulators**

- Fluoroscopy
- CT Simulation

## **7. Radiation Protection and Shielding**

### **A. Radiation Safety**

#### **1. Concepts and Units**

- Radiation Protection Standards
- Quality Factors
- Definitions for Radiation Protection
- Dose Equivalent

- Effective Dose Equivalent
  - 2. Types of Radiation Exposure
    - Natural Background Radiation
    - Man-Made Radiation
    - NCRP #91 Recommendations on Exposure Limits
  - 3. Protection Regulations
    - a) NRC Definitions
      - 1. Recordable Event
      - 2. Misadministration
    - b) NRC Administrative Requirements
      - 1. Radiation Safety Program
      - 2. Radiation Safety Officer
      - 3. Radiation Safety Committee
      - 4. Quality Management Program
    - c) NRC Regulatory Requirements
    - d) Personnel Monitoring
- B. Radiation Shielding**
- 1. Treatment Room Design
    - a) Controlled/Uncontrolled Areas
    - b) Types of Barriers
    - c) Factors in Shielding Calculations
      - 1. Workload (W)
      - 2. Use factor (U)
      - 3. Occupancy factor (T)
      - 4. Distance
  - 2. Shielding Calculations
    - a) Primary Radiation Barrier
    - b) Scatter Radiation Barrier
    - c) Leakage Radiation Barrier
    - d) Neutron Shielding for High Energy Photon and Electron Beams
  - 3. Sealed Source Storage
  - 4. Protection Surveys
    - a) Types of situation to use
      - 1. Ionization chamber (Cutie Pie)
      - 2. Geiger-Mueller Counters
      - 3. Neutron Detectors
      - 4. Scintillation Detectors

## **Radiation Therapy Physics**

### **1. Beam Calibration**

#### **A. Calibration of Megavoltage Beams**

- Photon beams
- Electron beams
- $C_\lambda$  and  $C_E$  methods: A historical perspective
- Dose calibration parameters
- TG-21 protocol (Brief discussion)
- TG-51 protocol

### **2. Clinical Dosimetry – External Beams: Photons and IMRT**

#### **A. External Beam Dosimetry Concepts (Part I)**

1. Dosimetric Variables
  - Inverse Square Law
  - Backscatter factor
2. Peak Scatter Factor
  - Electron Buildup
  - Percent Depth Dose
    - Mayneord F-factor
    - TAR Correction to F-factor
  - Equivalent Squares

#### **B. External Beam Dosimetry Concepts (Part II)**

- Tissue-air Ratio
- Scatter-air Ratio
- Tissue-phantom Ratio
- Tissue-maximum Ratio

#### **C. System of Dose Calculations**

1. Monitor Unit Calculations
  - a) Output Factor
  - b) Field Size Correction Factors
  - c) Collimator Scatter Factor and Phantom Scatter Factor
  - d) Beam Modifier Factors
  - e) Patient Attenuation Factors
2. Calculations in Practice
  - a) SSD Technique
    1. SSD Treatment same as SSD of Calibration
    2. SSD Treatment Different from SSD of Calibration
    3. SSD Treatment and SAD Calibration
  - b) SAD Technique
    1. SAD Treatment and SAD Calibration
    2. SAD Treatment and SSD Calibration
    3. SAD Rotational Treatment



## **Intensity Modulated Radiotherapy (IMRT)**

### **A. Dose prescription & inverse planning**

1. Concepts
2. Dose prescriptions and inverse planning
3. Dose calculations
4. IMRT quality assurance

### **B. IMRT Delivery Systems**

1. Segmental MLC (SMLC) and Dynamic MLC (DMLC)
2. Serial Tomotherapy (MIMiC)
3. Helical Tomotherapy
4. Robotic Linac
5. Simulation and immobilization/repositioning

## **2. Clinical Dosimetry – External Beams: Treatment planning**

### **A. Dose Volume Histogram, Dose Volume Specification and Reporting**

- Definitions of GTV, CTV, ITV, PTV
- How DVH Created in Planning System?
- Usefulness of DVH in Evaluating a Plan
- ICRU 50 Prescribing, Recording and Reporting Photon Beam Therapy (GTV, CTV, PTV)
- ICRU Report 62: (Supplement to ICRU Report 50)

### **B. Translation of Planning to Calculations**

1. Beam Weighting
2. Arc rotation therapy
3. Irregular Fields

### **C. Computerized Treatment Planning**

1. Isodose curves (beam characteristics)
2. Skin Dose
3. Parallel Opposed Beam Combination
  - SSD and SAD techniques
4. Wedge Isodose Curves
  - a) Wedge Angle and Hinge Angle
  - b) Wedge Factor
5. Wedge Techniques
  - a) Wedge Pair – Examples of H&N plans
  - b) Open and Wedged Field Combination
  - c) Skin Compensation
6. Beam Combination (3-,4-,6- field techniques)
  - SSD and SAD techniques: Examples of breast, prostate, brain, lung and other 3D plans

### **D. Field Shaping, Skin dose and Field Separation**

1. Field Shaping
  - a) Block Thickness
  - b) Block Divergence
  - c) Custom Blocking
  - d) Independent Jaws
  - e) MLCs

2. Skin dose
  - a) Electron Contamination of Photon Beams
  - b) Skin Sparing as a Function of Photon Energy
  - c) Effect of Absorber-skin Distance
  - d) Electron Filters
  - e) Skin Sparing at Oblique Incidence
3. Adjoining fields & Special Dosimetry Problems
  - a) Two-Field Problem
  - b) Three-Field Problem
  - c) Craniospinal Gapping
  - d) Pacemaker
  - e) Gonadal Dose
  - f) Pregnant Patient

## **2. Clinical Dosimetry – External Beams: Electrons**

### **A. Basic Characteristics**

- Features of Depth dose
- Rules of Thumb
- Selection of energy, field size
- Properties of depth dose
- Effects of Field size on depth dose
- Interactions of electron beams with a medium
- Effect of air gap
- Beam modifiers – Bolus
- Isodose distributions
  - Features of isodose
- Field Matching and other considerations
  - Electron-electron Gapping
  - Electron-photon Gapping
- Effect of oblique incidence
- Effect of sharp irregularities
- Effect of internal shielding
- Effect of tissue heterogeneities

## **3. Brachytherapy (8 hrs)**

### **A. Radioactive Sources (General Information)**

- Radium
- Cesium-137
- Cobalt-60
- Iridium-192
- Gold-198
- Iodine-125
- Palladium-103

### **B. Calibration of Brachytherapy Sources**

- Specification of Source Strength

- Radium Substitutes and Radioactive Isotopes Currently Used in Brachytherapy
- Linear Sources
- Seeds
- Exposure Rate Calibration
- C. Calculations of Dose Distributions**
  - Biological considerations of dose, dose rate, and fractionation
  - Calculation of dose from a point source
  - Calculation of dose from a line source
  - Dose calculations using AAPM TG43U formalisms
- D. Systems of Implant Dosimetry**
  - Paterson-Parker
  - Quimby
  - Memorial
  - Paris
  - Computer
- E. Implantation Techniques**
  - Surface Molds/Plaques
  - Interstitial Therapy
  - Intracavitary Therapy
  - Uterine Cervix
    - Milligram-Hours
  - Manchester System
    - Bladder and Rectum Dose
  - ICRU System
    - Absorbed Dose at Reference Points
- F. Gynecological Implants**
  - General Information (advantages/disadvantages)
  - Remote Afterloading Units
  - HDR vs. LDR
- G. High Dose Rate Brachytherapy**
  - Remote Afterloader
  - High Dose Rate Applicators
  - Facility Design – Shielding and Safety Features
  - Licensing Requirements
    - HDR Quality Management Program
    - Pre-treatment Safety Checks
    - HDR Operating Procedures
    - Emergency Procedures
  - HDR Source Calibration
  - Treatment Planning: Examples of Endobronchial treatment, Esophagus, Breast, Head and Neck, Oral cavity, Bile duct, cervix, Endometrium etc.
    - Simulation
    - Computer Planning
      - Dose Computation and Plan Verification
      - Quality Assurance

#### **H. Special Procedures**

- Syed Interstitial Implant for GYN
- Breast Implants – Interstitial vs Mammosite
- Prostate
  - HDR
  - Permanent Seed Implants with I-125 and Pd-103
- Permanent I-125 Vicryl Mesh Implant
- IVBT

#### **I. Radiation Protection for Brachytherapy**

- Detectors
- Regulatory Requirements
- Surveys
- Inventory and Wipe Tests
- Shipping and Receiving

### **4. Quality Assurance**

#### **A. Overview of Quality Assurance in Radiation Therapy**

- Goals
- Staffing
- Roles, training, duties & responsibilities of individuals
- Equipment Selection and Specifications

#### **B. Linac, Simulator, CT Simulator and HDR QA**

1. Acceptance Testing – Linac
2. Commissioning – Linac
  - Data Required
  - Commissioning of computerized treatment planning system
3. Routine Quality Assurance and Test Tolerance of Linac
  - Daily QA
  - Monthly QA
  - Yearly QA
4. HDR QA

### **5. Radiosurgery: Gamma Knife and Cyber Knife**

#### **A. Stereotactic Radiosurgery**

1. SRS Delivery Systems
2. Gamma Knife
3. Robotic Linac – Cyber Knife
5. Simulation and immobilization/repositioning

#### **B. SRS Dose prescription & treatment planning**

1. Treatment calculations
2. SRS quality assurance



## NUCLETRON TRAINING SEMINAR ATTENDANCE REGISTRATION

Hospital: ShadySide Date: 9-17-03  
Course: HDR Inservice Emergency Training  
Instructor: Paul E. Glessner

NAME	DEPARTMENT	TITLE	SIGNATURE
Edward D Brandner	Medical Physics Radiation Oncology	Post-doc Physicist	<i>Edward Brandner</i>
Chang B Pan	Rad onc	Physicist	<i>Chang B Pan</i>
Hungcheng Chen	Rad onc	Physicist	<i>Hungcheng Chen</i>
Jinglong Li	Rad. Onc	Physicist	<i>Jinglong Li</i>

I certify that the above individuals have been instructed in Equipment Operation, Safety Precautions and Emergency Procedures in accordance with Nucletron Corporation Training Standards.

Instructor Signature: *Paul E. Glessner*  
Instructor Title: Field Eng  
Date: 9-17-03



# University of Pittsburgh

Center for Continuing Education  
in the Health Sciences

This is to certify that

***Ed Brandner***

**Attended the Continuing Medical Education Activity**

## ***Breast Brachytherapy Training Program***

**March 14, 2003**

**Magee-Womens Hospital  
Pittsburgh, Pennsylvania**

The University of Pittsburgh School of Medicine, as part of the Consortium for Academic Continuing Medical Education, is accredited by the Accreditation Council for Continuing Medical Education to sponsor continuing medical education for physicians.

The Center for Continuing Education in the Health Sciences designates this educational activity for a maximum of 4.75 category 1 credits toward the AMA Physician's Recognition Award. Each physician should claim only those credits that he/she actually spent in the educational activity.

Other health care professionals are awarded .475 Continuing Education Units (CEUs) which are equivalent to 4.75 contact hours.

For AMA Physician's Recognition Award Category 1 credits, please access our website, after ninety days, at "[www.upmc.edu/ccehs/Credit\\_Transcripts.htm](http://www.upmc.edu/ccehs/Credit_Transcripts.htm)" for your credit transcript.

# CAMPEP

## Commission on Accreditation of Medical Physics Education Programs, Inc.

### *Certificate of Medical Physics Continuing Education Credits*

BRANDNER, EDWARD MEDICAL PHYSICIST  
UPMC  
ARNOLD PALMER PAVILION  
2000 VILLAGE DRIVE  
GREENSBURG, PA 15601 UNITED STATES

Attended the CAMPEP accredited medical physics education program during the 45th Annual Meeting of the American Association of Physicists in Medicine, July 25 - 29, 2004 in Pittsburgh, PA, and is awarded Medical Physics Continuing Education Credits (MPCECs) as designated.

<u>Course Code</u>	<u>Course Title</u>	<u>Credits</u>
PO	Standard Poster Displays	1.00
MO-A-319-CE	PET Physics and Technology -1	1.00
MO-B-310-CE	Radiation Safety and Risk Management-1	1.00
WE-A-BRB-CE	CT/PET in Radiation Oncology	1.00
WE-B-310-CE	Radiation Safety and Risk Management-3	1.00
<b>Total:</b>		<b>5.00</b>



Bruce Thomadsen, Ph.D.  
Chair, CAMPEP Continuing Education  
Credit Review Committee



Lisa Rose Sullivan  
Manager, Continuing Education





# The University of Virginia



*The General Faculty of the University of Virginia  
have conferred the degree of*


**Doctor of Philosophy**  
**Physics**

*upon*

**Edward Daniel Brandner**

*who has completed the courses prescribed for this deg.*

*In Testimony Whereof the General Faculty have caused a  
Diploma to be issued, verified by the signatures of  
President of the University and the Dean of the Scho  
and under the corporate seal of the University, attested  
by the Registrar, at Charlottesville, Virginia, this  
nineteenth day of May, 1996 and in the two hundred  
twentieth year of the Commonwealth.*



Ann R. Antrobus  
Registrar

John T. Coaker  
Pro.

Raymond Lee



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 [REDACTED]

PHYS 999	NON-TOPICAL RESEARCH	S	6.0				
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*** PAGE 1 OF 1 / END OF TRANSCRIPT ***							

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PHD/PHYSICS

MAY 19, 1996

DISSERTATION: THE DAMPING OF LAYERED MATERIALS AS DETERMINED BY THEIR INTERLAYER FORCES

**MAJOR**

PHYSICS

**COMPLETED COURSES**

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PHYS 521	THEORETICAL MECHS	B-	3.0
PHYS 593	INDEPENT STUDY	A	3.0
PHYS 725	MATH PHYSICS	B	3.0
PHYS 751	QUANTUM THEORY I	B-	3.0

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PHYS 742	ELEC MAGNETSM I	B	3.0
PHYS 752	QUANTUM MECHANICS II	B	3.0
PHYS 831	STAT MECH I	B	3.0

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PHYS 593	INDEPENDENT STUDY	A	3.0
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PHYS 961	RES SEM IN SOLID STATE PHYSICS	A	3.0

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PHYS 575	INTRODUCTION PARTICLE PHYSICS	A-	3.0
PHYS 593	INDEPENDENT STUDY	A	3.0
PHYS 962	RSCH SEM SOLID STATE PHYSICS	A	3.0

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PHYS 999	NON-TOPICAL RESEARCH	S	6.0
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**FALL 1993 GRADUATE SCHOOL OF ARTS AND SCIENCES**

PHYS 861	SOLID STATE I	B+	3.0
PHYS 999	NON-TOPICAL RESEARCH	S	9.0

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*Carol A. J. Zanley*  
 UNIVERSITY REGISTRAR

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GENEVA COLLEGE  
BEAVER FALLS, PA. 15010

BRANDNER, EDWARD DANIEL - [REDACTED]

NAME AND ADDRESS OF  
PARENT, GUARDIAN OR SPOUSE [REDACTED]

same

DATE OF BIRTH [REDACTED] SEX M SOCIAL SECURITY NO [REDACTED] ENTRANCE DEFICIENCIES:  
ENGLISH \_\_\_\_\_ LANGUAGE \_\_\_\_\_ MATHEMATICS \_\_\_\_\_

HIGH SCHOOL Shawnee Heights High School MAJOR PHYSICS RESEARCH HONORS: ELECTRICAL ENGINEERING  
ADDRESS Tecumseh, KS 66542  
GRADUATED FROM HIGH SCHOOL May 29, 1988 MINOR \_\_\_\_\_ MAGNA CUM LAUDE  
GENEVA MATRICULATION August 26, 1988 DEGREE B.S. C.P.A. 3.6748 RANK IN CLASS 30/252  
GRADUATION DATE August 15, 1991

SUBJECT NAME	NO.	COURSE TITLE	GRD.	SEM HRS	GRADE POINTS
FIRST SEMESTER 1988-1989					
BIB 126	126	BIBLE INTRO I	A	3	12
CSC 130	130	PASCAL	A	3	12
MAT 162	162	CALCULUS II	A-	4	16
PHY 201	201	COLLEGE PHYSICS	A-	4	16
SPH 101	101	PRIN OF SPEECH	A	3	12
TOTAL SEM		17	68	4.0000	
CUM		17	68	4.0000	

CREDIT BY EXAMINATION--September 2, 1988  
MAT 161 CALCULUS I C- 4 8  
TOTAL SEM 4 8 2.0000  
CUM 21 76 3.6190

SECOND SEMESTER 1988-1989

BIB 113	113	BIBLE INTRO II	A	3	12
MAT 261	261	CALCULUS III	A	4	16
MAT 405	405	DIFF EQUATIONS	B+	4	12
PHY 202	202	COLLEGE PHYSICS	B+	4	12
PSY 105	105	PSYCH OF ADJUST	A	3	12
TOTAL SEM		18	64	3.5556	
CUM		39	140	3.5897	

FIRST SEMESTER 1989-1990

CHM 101	101	GEN & ORG CHEM	A	4	16
CSV 215	215	COMMUNITY SERVICE	CR	1	0
ELE 323	323	ELEMENTS OF ELEC	H	3	9
ENG 101	101	ENGLISH COMP	B+	3	9
HUM 101	101	CULT THRU REN	A	3	12
PHY 105	105	RETH THOUR PHYS	A	3	12
TOTAL SEM		17	58	3.6250	
CUM		56	198	3.6000	

SUBJECT NAME	NO.	COURSE TITLE	GRD.	SEM HRS	GRADE POINTS
SECOND SEMESTER 1989-1990					
CHM 102	102	GEN & ORG CHEM	A	4	16
CSC 491	491	C PROGRAMMING	A	3	12
CSV 215	215	COMMUNITY SERVICE	CR	1	0
HUM 102	102	CULT THRU REN	A-	3	12
MAT 308	308	ABSTRACT ALGEBRA	A	3	12
PED 102	102	BASKETBALL	A	1	4
PHY 304	304	ADV PHYS HEAS	A	1	4
SOC 201	201	INTRO TO SOCIOLOGY	B	3	9
TOTAL SEM		19	69	3.8333	

CUM 75 267 3.6575

FIRST SEMESTER 1990-1991

ELE 309	309	ELECTROICS I	A	3	12
ENG 222	222	YEARBOOK	CR	1	0
HUM 201	201	CULT SINCE REN	B	3	9
MAT 350	350	NUMERICAL METHODS	A	3	12
MAT 408	408	COMPLEX VARIABLES	B	3	9
PHY 301	301	CLASSICAL MECH	A	3	12
PHY 303	303	ADV PHYS HEAS	A	1	4
PHY 408	408	THERMODYNAMICS	A	3	12
TOTAL SEM		20	70	3.6842	

CUM 95 337 3.6630

SECOND SEMESTER 1990-1991

BIB 114	114	FOUND OF CHR TRUTH	A	3	12
HUM 202	202	W CULT SINCE REN	B	3	9
MAT 409	409	PART DIFF EQDA	B	3	9
PED 102	102	WEIGHT TRAINING	A	1	4

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SUBJECT NAME	NO.	COURSE TITLE	GRD.	SEM HRS	GRADE POINTS
SUMMER SEMESTER 1991					
ELE 309	309	ELECTROICS I	A	3	12
TOTAL SEM		3	12	4.0000	
CUM		120	431	3.6838	

PHY 306	306	OPTICS	A	3	12
PHY 408	408	MODERN PHYSICS	A	3	12
PHY 495	495	SENIOR RESEARCH PROJ	A	3	12
PHI 352	352	GREAT ISSUES	A	3	12
TOTAL SEM		22	82	3.7273	
CUM		117	419	3.6754	

SUMMER SEMESTER 1991					
ELE 309	309	ELECTROICS I	A	3	12
TOTAL SEM		3	12	4.0000	
CUM		120	431	3.6838	

COMMUNITY COLLEGE OF BEAVER COUNTY  
MONACA, PA 15061  
SUMMER 1991  
BB255-70 ECONOMICS I A 3 12  
HE156-71 ENGLISH COMP II B 3 9  
TOTAL SEM 6 21 3.5000  
CUM 126 452 3.6748

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*Ann L. Willman*  
Registrar

This is to acknowledge the receipt of your letter/application dated

3/26/2005, and to inform you that the initial processing which includes an administrative review has been performed.

Amendment 37-09463-01  
There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

Please provide to this office within 30 days of your receipt of this card

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A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 136848.  
When calling to inquire about this action, please refer to this control number.  
You may call us on (610) 337-5398, or 337-5260.

(FOR LFMS USE)  
INFORMATION FROM LTS

BETWEEN:

License Fee Management Branch, ARM  
and  
Regional Licensing Sections

: Program Code: 02230  
: Status Code: 2  
: Fee Category: 7C  
: Exp. Date: 20050228  
: Fee Comments: CODE 23  
: Decom Fin Assur Req'd: N  
:.....

LICENSE FEE TRANSMITTAL

A. REGION I

1. APPLICATION ATTACHED

Applicant/Licensee: LATROBE AREA HOSPITAL  
Received Date: 20050419  
Docket No: 3003115  
Control No.: 136848  
License No.: 37-09463-01  
Action Type: Amendment

2. FEE ATTACHED

Amount: /  
Check No.: /

3. COMMENTS

Signed Rebecca J. J. J.  
Date 4/19/2004

B. LICENSE FEE MANAGEMENT BRANCH (Check when milestone 03 is entered /\_/)

1. Fee Category and Amount: \_\_\_\_\_

2. Correct Fee Paid. Application may be processed for:

Amendment \_\_\_\_\_  
Renewal \_\_\_\_\_  
License \_\_\_\_\_

3. OTHER \_\_\_\_\_

Signed \_\_\_\_\_  
Date \_\_\_\_\_