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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 Squillo
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'rd 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 in 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 fine 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,

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,

Satya Ranjan Bose

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

UPMC Cancer Center

at UPMC Passavant

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

UPMC Passavant Cranberry
51. Francis Way
Cranberry Township, PA 160
724-772-5380
Fax: 724-772-5386

March 10, 2005

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

Raj N. Selvaraj, MS
UPMC Cancer Centers
Certified Senior Medical Physicist
Clinical Assistant Professor
Department of Radiation Oncology
Medical Physics Division

NRC FORM 313A
(10-2002)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0120
EXPIRES: 10/31/2005

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

NRC FORM 313A
(10-2002)

U.S. NUCLEAR REGULATORY COMMISSION

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 Komandur	UPMC	6

NRC FORM 313A
(10-2002)

U.S. NUCLEAR REGULATORY COMMISSION

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-tme radiation safety experience (in areas identified in item 5a) under supervison
☐ N/A of _____ the RSO for License No. _____.

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
☐ N/A _____ who meets requirements for Authorized Medical Physicists; and

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

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 ☑ Authorized Medical Physicist
☐ Radiation Safety Officer ☐ 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
Latrobe Area Hospital
121 W. Second Ave
Latrobe, PA 15650

E. Materials License Number

37-09463-01

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

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

☒ YES ☐ N/A 11b. The individual named in Item 1. is competent to independently function as an authorized 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*)	D. SIGNATURE -- PRECEPTOR	E. DATE
RAJ N. SELVARAJ	Raj N. Selvaraj	3-10-05

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

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

☒ YES ☐ N/A 11b. The individual named in Item 1. is competent to independently function as an authorized 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)*	D. SIGNATURE OF PRECEPTOR	E. DATE
SATYA R BOSE	Satya Ranjan Bose	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
       - α-particle decay
       - β-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 γ 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_λ 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
- Fecility 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

NUCLETRON CORPORATION
7080 Columbia Gateway Drive
Columbia, MD 21046-2133

Telephone: 410-312-4100
Toll Free: 800-336-2249
Canada Toll Free: 800-445-2249
FAX: 410-312-4196

NUCLETRON TRAINING SEMINAR
ATTENDANCE REGISTRATION

Hospital: Shadyside Date: 9-17-03

Course: HDR Inservice Emergency Training

Instructor: David E. Olessner

NAME	DEPARTMENT	TITLE	SIGNATURE
Edward D Brandner	Medical Physics Radiation Oncology	Post-doc Physics	[illegible]
Cheng B Sun	Rad Onc	Physicist	[illegible]
Hungcheng Chen	Rad onc	Physicist	[illegible]
Jingdong Li	Rad. Onc	physicist.	[illegible]

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: [illegible]

Instructor Title: Field Eng

Date: 9-17-03

WHITE - Administration YELLOW - Service PINK - Customer

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" 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.

Course Code	Course Title	Credits
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
	Total:	**5.00**

Bruce Thomadsen

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

Lisa Rose Sullivan

Lisa Rose Sullivan
Manager, Continuing Education

Certificate of Attendance

This Certifies that

Edward D Brandner

Attended the

Applications Training Session(s) for: **VARiS Vision 6.5/7.0**

System 6.5 Administration	CAZ0223009	X 4.0 Credits	VARiS Simulation	CAZ0228011	1.0 Credit
VARiS Patient Manager	MOZ0224003	1.5 Credits	VARiS Treatment	CAZ0228012	X 1.0 Credit
System 6.5 RT Chart	CAZ0223010	X 4.0 Credits	VARiS Time Planner	MOZ0224004	X 2.0 Credits
VARiS Activity Capture	MOZ0224002	X 2.0 Credits	PortalVision	CAZ0228005	3.0 Credits
	VARiS Vision	CAZ0228006	3.0 Credits		

This participant received a total of 13.0 Category A Credits for this Training.

Participant's Social Security Number:

_____ - _____ - _____

VARIAN medical systems
Clinical Support Services

Authorized Representative

March 3, 2008
Date

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, attes by the Registrar, at Charlottesville, Virginia, this nineteenth day of May, 1996 and in the two hundred twentieth year of the Commonwealth.*

John T. Casteen
Pre

Ann R. Antrobus
Registrar

Raymond C. Wel

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EDWARD DANIEL BRANDNER

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ISSUED TO:

EDWARD BRANDNER
[redacted]

DEGREES CONFERRED
PHD/PHYSICS
MAY 19, 1996
DISSERTATION: THE DAMPING OF LAYERED MATERIALS AS DETERMINED BY THEIR INTERLAYER FORCES

MAJOR
PHYSICS

COMPLETED COURSES

COURSE NUMBER	COURSE TITLE	GRADE	CREDITS
FALL 1991 GRADUATE SCHOOL OF ARTS AND SCIENCES			
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 1	B-	3.0
SPRING 1992 GRADUATE SCHOOL OF ARTS AND SCIENCES			
PHYS 593	INDEP STUDY	A	3.0
PHYS 742	ELEC MAGNETSM 1	B	3.0
PHYS 752	QUANTUM MECHANICS II	B	3.0
PHYS 831	STAT MECH I	B	3.0
FALL 1992 GRADUATE SCHOOL OF ARTS AND SCIENCES			
PHYS 547	INTRO TO MOLECULAR BIOPHYSICS	B+	3.0
PHYS 593	INDEPENDENT STUDY	A	3.0
PHYS 743	ELECTRICITY & MAGNETISM II	B-	3.0
PHYS 961	RES SEM IN SOLID STATE PHYSICS	A	3.0
SPRING 1993 GRADUATE SCHOOL OF ARTS AND SCIENCES			
PHYS 562	INTRO TO SOLID STATE PHYSICS	A-	3.0
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
SUMMER 1993 GRADUATE SCHOOL OF ARTS AND SCIENCES			
PHYS 999	NON-TOPICAL RESEARCH	S	6.0
FALL 1993 GRADUATE SCHOOL OF ARTS AND SCIENCES			
PHYS 861	SOLID STATE I	B+	3.0
PHYS 999	NON-TOPICAL RESEARCH	S	9.0
SPRING 1994 GRADUATE SCHOOL OF ARTS AND SCIENCES			
MSE 703	TRANS ELECTRON MICROSCOPY	B	3.0
PHYS 999	NON-TOPICAL RESEARCH	S	9.0
SUMMER 1994 GRADUATE SCHOOL OF ARTS AND SCIENCES			
PHYS 999	NON-TOPICAL RESEARCH	S	6.0
FALL 1994 GRADUATE SCHOOL OF ARTS AND SCIENCES			
PHYS 999	NON-TOPICAL RESEARCH	S	12.0
SPRING 1995 GRADUATE SCHOOL OF ARTS AND SCIENCES			
PHYS 999	NON-TOPICAL RESEARCH	S	12.0
SUMMER 1995 GRADUATE SCHOOL OF ARTS AND SCIENCES			
PHYS 999	NON-TOPICAL RESEARCH	S	6.0
FALL 1995 GRADUATE SCHOOL OF ARTS AND SCIENCES			
PHYS 999	NON-TOPICAL RESEARCH	S	12.0
SPRING 1996 GRADUATE SCHOOL OF ARTS AND SCIENCES			
NRGA 002	NON-RESIDENT	NR	0.0

*** PAGE 1 OF 1 / END OF TRANSCRIPT ***

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*COURSE NOT COMPUTED IN GRADE POINT AVERAGE

Carol A. J. Zanley
UNIVERSITY REGISTRAR

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THE NAME OF THE UNIVERSITY APPEARS IN SMALL BLUE PRINT ACROSS THE FACE OF THIS 8.5 X 11 TRANSCRIPT

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
ADDRESS Tecumseh, KS 66542
GRADUATED FROM HIGH SCHOOL May 29, 1988
GENEVA MATRICULATION August 26, 1988
GRADUATION DATE August 15, 1991

MAJOR PHYSICS RESEARCH HONORS: ELECTRICAL ENGINEERING
MINOR MAGNA CUM LAUDE
DEGREE B.S. C.P.A. 3.6748 RANK IN CLASS 30/252

SUBJECT NAME	SUBJECT NO.	COURSE TITLE	GRD.	SEM HRS	GRADE POINTS
FIRST SEMESTER 1988-1989					
BIB	112	BIBLE INTRO I	A	3	12
CSC	130	PASCAL	A	3	12
MAT	162	CALCULUS II	A-	4	16
PHY	201	COLLEGE PHYSICS	A-	4	16
SPE	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	BIBLE INTRO II	A	3	12
MAT	261	CALCULUS III	A	4	16
MAT	405	DIFF EQUATIONS	B+	4	12
PHY	202	COLLEGE PHYSICS	B+	4	12
PSY	105	PSYCH OF ADJUST	A	3	12
TOTAL		SEM 18 64 3.5556			
		CUM 39 140 3.5897			
FIRST SEMESTER 1989-1990					
CHM	101	GEN & ORG CHEM	A	4	16
CSV	215	COMMUNITY SERVICE	CR	1	0
ELE	323	ELEMENTS OF ELEC	B	3	9
ENG	101	ENGLISH COMP	B+	3	9
HUM	101	W CULT THRU REN	A	3	12
PHY	405	MTH THEOR PHYS	A	3	12
TOTAL		SEM 17 58 3.6250			
		CUM 56 198 3.6000			
SECOND SEMESTER 1989-1990					
CHM	102	GEN & ORG CHEM	A	4	16
CSC	491	C PROGRAMMING	A	3	12
CSV	215	COMMUNITY SERVICE	CR	1	0
HUM	102	W CULT THRU REN	A-	3	12
MAT	308	ABSTRACT ALGEBRA	A	3	12
PED	102	BASKETBALL	A	1	4
PHY	304	ADV PHYS MEAS	A	1	4
SOC	201	INTR TO SOCIOLOGY	B	3	9
TOTAL		SEM 19 69 3.6333			
		CUM 75 267 3.6575			
FIRST SEMESTER 1990-1991					
ELE	309	FIELDS & WAVES	A	3	12
ENG	222	YEARBOOK	CR	1	0
HUM	201	W CULT SINCE REN	B	3	9
MAT	350	NUMERICAL METHODS	A	3	12
MAT	408	COMPLEX VARIABLES	B	3	9
PHY	301	CLASSICAL MECH	A	3	12
PHY	303	ADV PHYS MEAS	A	1	4
PHY	308	THERMODYNAMICS	A	3	12
TOTAL		SEM 20 70 3.6842			
		CUM 95 337 3.6630			
SECOND SEMESTER 1990-1991					
BIB	114	FOUND OF CHR THOT	A	3	12
HUM	202	W CUL SINCE REN	B	3	9
MAT	409	PART DIFF EQUA	B	3	9
PED	102	WEIGHT TRAINING	A	1	4
PHY	306	OPTICS	A	3	12
PHY	408	MODERN PHYSICS	A	3	12
PHY	495	SENIOR RSRCH PROJ	A	3	12
POL	352	GREAT ISSUES	A	3	12
TOTAL		SEM 22 82 3.7273			
		CUM 117 419 3.6754			
SUMMER SEMESTER 1991					
ELE	309	ELECTRONICS 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			

TO WHOM IT MAY CONCERN DATE -/

This is a true copy of the academic [illegible] student named. Unless otherwise noted on the [illegible] issuance carries with it honorable dism[illegible] copy is not official unless embossed with the College [illegible]

Ann L. Hollman
Registrar

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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

_____.

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.

NRC FORM 532 (RI)
(6-96)

Sincerely,
Licensing Assistance Team Leader

BETWEEN:

License Fee Management Branch, ARM
and
Regional Licensing Sections

(FOR LFMS USE)
INFORMATION FROM LTS

Program Code: 02230
Status Code: 2
Fee Category: 7C
Exp. Date: 20050228
Fee Comments: CODE 23
Decom Fin Assur Reqd: 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 Junod
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 _____