



Molecular Imaging Services, Inc.

"Excellence in Patient Care through State of the Art Imaging"

February 7, 2011

U. S. Nuclear Regulatory Commission
Region I
Licensing Assistance Team
475 Allendale Road
King of Prussia, PA 19408

VIA FAX: 610-337-5269

MS16
J-2

RE: License Amendment Request
License No. 07-30790-01
Docket No. 030-36176
Mail Control: 574020
Molecular Imaging Services, Inc.

Dear Ms. Elliot:

This letter is in response to your email dated February 3, 2011 requesting additional information on Dr. Marshall's training (see attached).

Per your request, I have attached the course schedule and the syllabus for the 80 hour Nuclear Licensing Course for Physicians. I have also attached a copy of the certificate for your quick reference.

Any questions regarding the above matter may be directed to Mr. Steve Henry, consultant, Krueger-Gilbert Health Physics, Inc. at (410) 692-9806 or to Frank DiGregorio, RSO, at (302) 750-3668.

Thank you for your time and consideration.

Sincerely,

Frank DiGregorio
Radiation Safety Officer

574020



Frank DiGregorio <fdigregorio2@gmail.com>

Amendment Request

Elliott, Robin <Robin.Elliott@nrc.gov>
To: Frank DiGregorio <fdigregorio@mismedical.com>
Cc: "Gabriel, Sandra" <Sandra.Gabriel@nrc.gov>

Thu, Feb 3, 2011 at 5:16 PM

Licensee: Molecular Imaging Services, Inc.

License Number: 07-30790-01

Docket Number: 030-36176

Mail Control: 574020

Dear Mr. DiGregorio,

As per our phone conversation today, please forward the course schedule for the 80 hour Nuclear Licensing Course for Physicians held by Associates in Medical Physics, LLC as supporting documentation for the training and experience section completed on the NRC Form 313A for Dr. Marshall.

Once we receive this additional information, we should be able to finalize the processing of your license amendment. You may respond to my attention in writing by letter or fax (610-337-5269), referencing mail control 574020. If we do not receive a reply from you within 30 calendar days from the date of this e-mail, we will assume that you do not wish to pursue your amendment.

Regards,

Robin

Robin L. Elliott

Health Physicist

US Nuclear Regulatory Commission

475 Allendale Road

King of Prussia, PA 19406

(610) 337-5076 voice

(610) 337-5269 fax

P Think Green - Not every email needs to be printed.

80 Hour Licensing Course
September 10-17, 2010 Cleveland, Ohio

Prepared: August 30, 2010

Day & Date	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Time	9/10/10	9/11/10	9/12/10	9/13/10	9/14/10	9/15/10	9/16/10	9/17/10
8:00 - 8:55	Intro FB	Instruments HV Calibration FB	Instruments Lab Eff FB	Introduction Regs 19-33 ES	7:00 AM Applied Math 8:00 AM Math & Regs DK	7:00 AM Applied Math 8:00 AM Analog Camera FB	7:00 AM Applied Math 8:00 AM RX Gen TV	7:00 AM Lic Cond ES 8:00 AM Lic Cond ES
9:00 - 9:55	Chart of Nuclides FB	Instruments Spectrometer FB	Instruments Lab Eff FB	Regs 19-33 ES	Math & RX DK	Analog Camera FB	RX Heart TV	Lic Cond ES
10:00 - 10:55	Chart of Nuclides FB	Instruments E-Res FB	Instruments Lab Stat FB	Math Introduction DK	Math & RX DK	PET Technical DK	RX - Gen NM TV	Lic Cond ES
11:00 - 11:55	Gas Detector FB	Instruments Windows FB	Instruments Lab Stat FB	Physics PE	Physics PE	Physics PE	UH FB	Lic Cond ES
12:00 - 12:55	Scintillation Detector FB	Instruments Lab Geo FB	RSO FB	Physics PE	Physics PE	Physics PE	UH FB	Rad Bio DK
1:00 - 2:00	LUNCH							
2:00 - 2:55	Scintillation Detector FB	Mobile Services ES	Accreditation LR	Physics PE	Physics PE	Computers PE	RX Lab ES/DK	Rad Bio DK
3:00 - 3:55	Licensing NRC-States ES	I & E ES	Declared Preg DK	Physics PE	Physics PE	Digital Camera PE	RX Lab ES/DK	Rad Bio DK
4:00 - 4:55	Lic App ES	Personnel Monitoring ES	Fetal Dose DK	Math & Units DK	Regs 35 ES	Reg -20 DK	RX Lab ES/DK	Rad Bio DK
5:00 - 5:55	Lic App ES	DOT ES	Shielding Design DK	Math & RX DK	Regs 35 ES	Regs - 20 DK	Radiation Safety Lab ES	Rad Bio DK
6:00 - 6:55	New Department ES	DOT ES	TX DK	Math & Rad. Safety DK	Math & RS DK	RX Regulators TV	Radiation Safety Lab ES	N/A

PART I - SYLLABUS FOR PHYSICS

	Text	Green	Blue	Tab
<p>I. Structure of Matter</p> <p>A. Atomic mass and energy units</p> <ol style="list-style-type: none"> 1. electron volt (eV) 2. atomic mass unit (amu) <p>B. Organization of the Atom</p> <ol style="list-style-type: none"> 1. Models of Atoms 2. Electrons <ol style="list-style-type: none"> a. Properties b. Quantum Principles 3. Binding Energies and Shells 4. X-rays, Origins and Properties 5. Auger Electrons, Internal Conversion Electrons 6. Periodic Table, Chart of the Nuclides 7. Nuclear Nomenclature - Z, A, P, N, e <p>C. Structure of Nucleus</p> <ol style="list-style-type: none"> 1. Nuclear Particles (Nucleons) 2. Quantum Energy Levels 3. Binding Energy 4. Mass Defect 5. Neutron: Proton Nuclear Stability 6. Isotopes, Isobars, Isotones 				
<p>II. Nuclear Reactions</p> <p>A. Alpha Decay</p> <p>B. Beta Decay</p> <p>C. Positron Decay</p> <p>D. Electron Capture</p> <p>E. Gamma Emission</p> <ol style="list-style-type: none"> 1. Isomeric Transition 2. Internal Conversion <p>F. Decay Schemes</p> <p>G. Radioactive Decay</p> <ol style="list-style-type: none"> 1. Half-life <ol style="list-style-type: none"> a. Physical b. Biological c. Effective 2. Decay Constant 3. Average Life Expectancy <p>H. Parent-Progeny Relationship</p> <ol style="list-style-type: none"> 1. Radioactive Series 2. Secular Equilibrium 3. Transient Equilibrium <p>I. Units of Activity</p> <ol style="list-style-type: none"> 1. Curie and Submultiples 2. SI Units <p>J. Specific Activity</p>				

PART II - SYLLABUS ON RADIATION DETECTION AND INSTRUMENTATION

	Text	Green	Blue	Tab
<p>I. Detectors</p> <p>A. Gas Detectors</p> <ol style="list-style-type: none"> 1. Theory of Gas Ionization 2. Types of Detectors <ol style="list-style-type: none"> a. Ionization b. Proportional c. Geiger-Mueller 3. Specific Examples in Nuclear Medicine <ol style="list-style-type: none"> a. Cutie Pie b. Proportional c. G-M d. Dose Calibrators e. Pocket Dosimeters 4. Quality Control and Assurance <p>B. Scintillation Detectors</p> <ol style="list-style-type: none"> 1. Theory of Light Emission and Collection 2. Scintillators <ol style="list-style-type: none"> a. Inorganic (NaI-Tl) b. Organic - Solid, Liquid 3. Components <ol style="list-style-type: none"> a. Detector/Photomultiplier Tubes b. High Voltage Power Supply c. Preamplifier and Amplifiers/Gain d. Pulse Height Analysis - Single/Multiple Channel e. Read-out Devices - Uptake/Well Systems 4. Solid state Detectors 				
<p>II. Qualitative and Quantitative Techniques</p> <p>A. Pulse Height Analyzers</p> <ol style="list-style-type: none"> 1. Spectra <ol style="list-style-type: none"> a. Components b. Energy Resolution c. Dependence On: <ol style="list-style-type: none"> (1) Detector (2) Source Configuration (3) Scattering Material 2. Integral vs. Differential 3. Assay of Radioactive Sources <ol style="list-style-type: none"> a. Standards b. Counter efficiency <ol style="list-style-type: none"> (1) Self Absorption (2) Scatter (3) Geometry (4) Dead Time (Resolving Time) (5) Efficiency 				

PART III - SYLLABUS ON RADIATION BIOLOGY

	Text	Green	Blue	Tab
I. Physical Factors A. Dose B. Dose Rate C. Relative Biologic Effect D. Quality Factor E. Dose Equivalent				
II. Radiation Chemistry A. Ionization B. Excitation C. Free Radical D. Interaction of Ionizing Radiation with Water E. Free Radical Reactions				
III. Radiation Biochemistry A. DNA Damage B. DNA Repair C. Other Biomolecular Damage				
IV. Radiation Effects on Cells A. Alteration of Proliferative Ability B. Chromosome Aberration C. Interphase Death D. Membrane Damage E. Metabolic Change F. Cell Division Delay				
V. Repair of Radiation Injury A. Sublethal Damage Repair B. Potentially Lethal Damage Repair				
VI. Factors Affecting Radiation Injury A. Physical 1. Dose 2. Dose Rate 3. Fractionation 4. Linear Energy Transfer B. Clinical 1. Oxygen Effect 2. Chemical Sensitizers 3. Chemical Protector C. Biological 1. Mitotic Rate 2. Degree of Differentiation 3. Normal Tissue Tolerance				

PART IV - SYLLABUS ON RADIATION PROTECTION

I. Radiation Units	Text	Green	Blue	Tab
II. Sources of Regulations A. NRC - Title 10 CFR, Regulatory Guide B. State regulations C. NCRP (National Council on Radiation Protection) D. ICRP (International Council on Radiation Protection) E. DOT (Department of Transportation)				
III. Radiation Exposure Regulations A. TEDE B. TODE C. DAC D. ALI E. Patient Release Criteria F. Breast Feeding Considerations				
IV. Licensing for Human Use of Radioactive Material A. NRC - How to Apply B. State - How to Apply C. Agreement State				
V. Principles of Radiation Protection A. From External Hazards - Distance, Shielding, Time B. From Internal Hazards - Entry, Contamination Control C. Handling Radioactive Gases - Iodine, Xenon D. Handling Radioactive Aerosols - DTPA				

PART V - SYLLABUS FOR MATHEMATICS

I. Significant Figures	Text	Green	Blue	Tab
II. Signed Numbers				
III. Algebra Review				
IV. Calculator Usage				
V. Exponentials and Scientific Notation				
VI. Ratios and Percentage				
VII. Applied Mathematics A. Concentrations 1. Concentration 2. Dilution 3. Sewer Disposal 4. Xenon Concentration B. Inverse Square 1. Inverse Square 2. Gamma Constant C. Decay Rate 1. Activity - Decay Rate Relations 2. Decay Constant/Half-Life 3. Decay Rate 4. Mean Life D. Decay Equation 1. Decay Equation 2. Decay Factors 3. Predecay E. Biological and Effective Half-Lives F. Shielding Equation 1. Shielding Equation 2. Attenuation Coefficients 3. Half-Value Layer G. Instrumentation 1. Resolution 2. Efficiency 3. Dead Time				
VIII. Statistics A. Counting Statistics B. Chi Square C. Imaging Statistics				

SYLLABUS ON NUCLEAR MEDICINE EXPERIMENTS

I. Radiopharmaceutical A. Chart of the Nuclides B. Generator Elution C. Mo-99 Breakthrough Test D. Chromatography E. Dose Preparation	Text	Green	Blue	Tab
II. Gas Detectors A. Calibration - Voltage B. Calibration - Radiation C. Dead Time				
III. Scintillation Detectors A. Calibration of Spectrometer B. Gamma Energy Spectrum C. Energy Resolution D. Proper Window Settings E. Linearity of Calibration F. Effects of Gain G. Statistics H. Assay of Mixed Gamma Sample I. Efficiency <ol style="list-style-type: none"> 1. Effect of Voltage 2. Effect of Window Settings J. Coincidence Loss K. Geometry L. Collimators <ol style="list-style-type: none"> 1. High vs. Medium vs. Low Energy 2. High Resolution vs. High Sensitivity 3. Parallel Hole vs. Pinhole vs. Slant Hole 4. Tomographic 				
IV. Scintillation Camera A. Proper Intensity Setting B. Flood Field Uniformity <ol style="list-style-type: none"> 1. Intrinsic - NEMA, Other 2. Total System C. Sensitivity - NEMA				

ASSOCIATES IN MEDICAL PHYSICS, LLC

THIS CERTIFIES THAT

Erik Marshall, M.D.

HAS SUCCESSFULLY COMPLETED ALL REQUIREMENTS
OF THE

**80 HOUR NUCLEAR LICENSING
COURSE FOR PHYSICIANS**

AND IS HEREBY AWARDED THIS CERTIFICATE OF COMPLETION
ON THE SEVENTEENTH DAY OF SEPTEMBER, 2010



DIRECTOR OF TRAINING