



Radiation Safety Manual

For Radiation Machines

November 2015

Florida Atlantic University

Environmental Health & Safety
Building CO69, Room 112
777 Glades Road
Boca Raton, FL 33431
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ehs@fau.edu

TABLE of CONTENTS

- I. ADMINISTRATION 1
 - A. RADIATION PROTECTION PROGRAM 1
 - B. X-RAY MACHINE REGISTRATION..... 1
 - C. ALARA POLICY 1
 - D. GENERAL X-RAY MACHINE USE GUIDELINES..... 1
 - E. PROGRAM EVALUATION 1
- II. INTRAORAL DENTAL X-RAY MACHINE 1
 - A. LICENSURE 1
 - B. TRAINING 1
 - C. POSTING 2
 - D. SECURITY 2
 - E. DOSIMETRY 2
 - F. DENTAL X-RAY MACHINE USE GUIDELINES 2
- III. ANALYTICAL X-RAY MACHINE 2
 - A. TRAINING 2
 - B. POSTINGS..... 3
 - C. HANDHELD X-RAY MACHINE TRANSPORTATION AND FIELD DOCUMENTS 3
 - D. SECURITY 3
 - E. DOSIMETRY 3
 - F. ANALYTICAL X-RAY MACHINE USE GUIDELINES 3
- IV. ATHLETIC DEPARTMENT X-RAY MACHINES (Reserved) 4
- V. DIAGNOSTIC MEDICAL X-RAY MACHINES (Reserved) 4
- VI. VETERINARY X-RAY MACHINES (Reserved) 4
- VII. EVALUATION 4
- VIII. ATTACHMENTS 5
 - A. Intraoral Dental X-ray Machine Training Outline 6
 - B. Notice to Employees for Dental Clinic..... 7
 - C. BRC Information Notice 17 For Dental Registrants 8
 - D. Analytical X-ray Machine Training Outline 9
 - E. Notice to Employees for Analytical X-ray Machine 10
 - F. Evaluation Form For Dental Clinic 13
 - G. Evaluation Form For Analytical X-ray Machine 14

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I. ADMINISTRATION

A. RADIATION PROTECTION PROGRAM

The use of radiation machines on Florida Atlantic University (FAU) campuses falls under the jurisdiction of the Radiation Safety Officer (RSO) and the Radiation Safety Committee (RSC). Radiation machines must be used as required by the FAU Radiation Safety Manual for Radiation Machines and [Florida Administrative Code \(FAC\) 64E-5](#). Radiation machine means any device capable of producing x-rays except those devices with radioactive materials as the only source of radiation. In this manual the words “x-ray machine” and “radiation machine” are synonymous. The FAU RSO may be contacted at 561 297 2385, 561 297 3129 or ehs@fau.edu.

B. X-RAY MACHINE REGISTRATION

X-ray machines must be registered with the FAU RSO and the Florida Department of Health, Bureau of Radiation Control (BRC). X-ray machine registrations included in this program are JR28043000, JR35243000, JR35526000, JR42087000 and one pending for Powder XRD Unit in Bldg. 55, Room 240B. Purchases and transfers of x-ray machines must receive prior approval of the RSO and RSC.

C. ALARA POLICY

The acronym ALARA means “As Low As Reasonably Achievable.” As a policy ALARA means making every reasonable effort to keep radiation exposures as far below regulatory limits as is practical. The Administration of FAU fully supports the policy that radiation doses should be ALARA. The x-ray machine use guidelines are intended to provide machine operators information to follow the ALARA policy and minimize worker and member of the public x-ray exposure.

D. GENERAL X-RAY MACHINE USE GUIDELINES

1. Radiation Protection Program records will be maintained by the RSO except where noted.
2. X-ray machines must be labeled with RSO approved caution or warning labels.
3. Rooms where x-ray machines are used must be posted with RSO approved caution or warning signs.
4. X-ray machines will only be serviced or repaired by a RSO approved vendors. Service records will be maintained by the appropriate program or principle investigator.
5. X-ray machines will be used according to manufacturer instructions and will not be modified.
6. X-ray machines must be secured when not in use to prevent unauthorized operation.

E. PROGRAM EVALUATION

The RSO will evaluate x-ray machine operations at least once each year in February and when changes occur that could affect dose.

II. INTRAORAL DENTAL X-RAY MACHINE

Intraoral dental x-ray machine means equipment designed for use with an intraoral image receptor. The use of an intraoral dental x-ray machine is regulated by [FAC 64E-5](#) parts 1, 3, 5 and 9.

A. LICENSURE

Intraoral dental x-ray machines will only be used on patients by health care workers licensed under Florida Statute 466 and FAC 64B5

B. TRAINING

Radiation Safety Training will be provided to persons operating intraoral dental x-ray machines at least once each year. Records of the training will be maintained by the Dental Clinic. The training will minimally consist of the subjects listed in the [Intraoral Dental X-ray Machine Training Outline](#).

C. POSTING

The following items will be posted in the Dental Clinic:

1. Radiation Machine Registration – the BRC registration is completed each October.
2. Health Care Worker Licenses.
3. [Notice To Employees For Dental Clinic](#) – the notice describes radiation worker rights to work place radiation safety information.
4. Caution or Warning Signs – none required for diagnostic x-ray machines by [FAC 64E-5](#).

D. SECURITY

X-ray machines will be secured, when unattended, by locking access doors or locking the machines.

E. DOSIMETRY

1. Individual monitoring (x-ray badge) will not be provided to dental clinic x-ray machine operators because the operators do not have the potential to receive 10 percent of the annual permissible dose when following these guidelines. See [BRC Information Notice 17](#) for further information.
2. An x-ray machine operator may declare pregnancy. The declaration must be voluntary and be in writing to the FAU RSO. If an x-ray machine operator declares pregnancy, an x-ray badge will be provided. The x-ray badge will be worn on the torso at waist level at work during the gestation period. The badge will be used to estimate fetal dose.
3. The FAU RSO may be contacted at 561 297 2385, 561 297 3129 or ehs@fau.edu.

F. DENTAL X-RAY MACHINE USE GUIDELINES

The dental x-ray machine use guidelines are intended to keep x-ray exposure dose ALARA and to maintain compliance with [FAC 64E-5](#) member of the public dose requirements.

1. X-ray machine operators will stand at least 6 feet from the patient and tube head, and outside the useful beam or behind a protective barrier during exposures.
2. X-ray machine operators will not hold imaging devices during an exposure.
3. X-ray machines will not be operated while directed at anyone other than a patient.
4. X-rays machines will not be operated on humans for training, demonstration or other non-healing art purposes.
5. The x-ray machine operator and the patient will be the only persons in the room during an exposure.
6. A damaged or broken x-ray machine will not be operated.
7. If an x-ray machine does not stop producing x-rays when the exposure control is released, the x-ray machine will be turned off. The x-ray machine will be turned off at the breaker if necessary.
8. Lead aprons are available for patients that request an apron during an exposure. Lead aprons will be offered to patients that may be pregnant.
9. The FAU Radiation Safety Manual For Radiation Machines, operating procedures and x-ray machine manuals will be available to the x-ray machine operator.
10. Report suspected or actual overexposures to patients or staff to the RSO as soon as possible.
11. The FAU RSO may be contacted at 561 297 2385, 561 297 3129 or ehs@fau.edu.

III. ANALYTICAL X-RAY MACHINE

Analytical x-ray machine means equipment used for x-ray diffraction, x-ray spectroscopy or x-ray fluorescence analysis. The use of an analytical x-ray machine is regulated by [FAC 64E-5](#) parts 1, 3, 7 and 9. Two types of analytical x-ray machine are used at FAU – Enclosed Cabinet and Handheld. The requirements are the same except where noted.

A. TRAINING

Radiation Safety Training will be provided to individuals prior to initial operation or use of any analytical x-ray machine. Contact the RSO at 561 297 2385, 561 297 3129 or ehs@fau.edu to

schedule initial training. Refresher training must be taken at least every 12 months after the initial training. Refresher training may be taken on-line at <http://www.fau.edu/divdept/envhs/training/Train.htm>. Records of the training will be maintained by the RSO. The training will minimally consist of the subjects listed on [Analytical X-ray Machine Training Outline](#).

B. POSTINGS

The following items will be posted where enclosed cabinet machines are located and where handheld machines are stored.

1. Radiation Machine Registration – the BRC registration is completed each October.
2. Notice To Employees For Analytical X-ray Machine – the notice describes radiation worker rights to work place radiation safety information.
3. Caution or Warning Signs

C. HANDHELD X-RAY MACHINE TRANSPORTATION AND FIELD DOCUMENTS

The following items will be kept with a handheld x-ray machine when removed from the storage location.

1. Radiation Machine Registration
2. Notice To Employees For Analytical X-ray Machines
3. FAU Radiation Safety Manual For Radiation Machines
4. Operating Procedures
5. X-ray Machine Manufacturer Operation Manual

D. SECURITY

X-ray machines will be secured when unattended.

1. Enclosed cabinet machines will be secured by locking access doors or removing keys necessary to operate the machine. Keys will be stored separately from the machine.
2. Handheld machines will be stored in a locked cabinet. Handheld machines will not be left unattended when out of storage or will be secured with a lock.

E. DOSIMETRY

1. Individual finger or wrist monitoring (x-ray badge) will be provided and must be worn when operating or using a handheld x-ray machine.
2. Individual whole body monitoring (x-ray badge) will not be provided for enclosed cabinet x-ray machine operators and users. Exposure does not have the potential to exceed 10 percent of the annual permissible dose when these guidelines are followed.
3. An x-ray machine operator or user may declare pregnancy. The declaration must be voluntary and be in writing to the FAU RSO. If pregnancy is declared, an x-ray badge will be provided. The x-ray badge will be worn on the torso at waist level, when operating or using an x-ray machine, during the gestation period. The badge will be used to estimate fetal dose.
4. Report suspected or actual overexposures to the RSO as soon as possible.
5. The FAU RSO may be contacted at 561 297 2385, 561 297 3129 or ehs@fau.edu.

F. ANALYTICAL X-RAY MACHINE USE GUIDELINES

The x-ray machine use guidelines are intended to keep x-ray exposure dose ALARA and to maintain compliance with [FAC 64E-5](#) member of the public dose requirements.

1. Enclosed cabinet x-ray machines will only be operated with the shutter mechanisms and safety interlocks engaged. Shutters and safety interlocks will not be tampered with or disabled.
2. Enclosed cabinet x-ray machine operators will not place specimens in the machine while exposure is occurring.
3. Enclosed cabinet x-ray machine shutters and shielding will not be cleaned unless the x-ray tube has been verified to be completely de-energized.

4. Enclosed cabinet x-ray machines will not be operated if any radiation shielding has been removed.
5. Handheld x-ray machines will only be operated with manufacturer provided shielding properly attached to the machine.
6. Handheld x-ray machine operators will not hold imaging devices during an exposure.
7. Handheld x-ray machines will not be operated while pointed at any person.
8. Visitors will not be allowed to operate x-ray machines.
9. A damaged or broken x-ray machine will not be operated.
10. If an x-ray machine does not stop producing x-rays when the exposure control is released, the x-ray machine will be turned off. The x-ray machine will be turned off at the breaker if necessary.
11. The FAU Radiation Safety Manual for X-ray Machines, operating procedures and x-ray machine manuals will be available to the x-ray machine operator.

IV. ATHLETIC DEPARTMENT X-RAY MACHINES (Reserved)

V. DIAGNOSTIC MEDICAL X-RAY MACHINES (Reserved)

VI. VETERINARY X-RAY MACHINES (Reserved)

VII. EVALUATION

The Radiation Protection Program in the FAU Radiation Safety Manual for Radiation Machines is used to minimize unnecessary exposure to employees and the general public, and help prevent exposure that exceeds limits in [FAC 64E-5](#).

Leanne Cobb is responsible for the Radiation Protection Program.

The signature below attests this registrant has evaluated the provisions of the Radiation Protection Program as described in the FAU Radiation Safety Manual for Radiation Machines and agrees they accurately describe the conditions present. All Principle Investigators and x-ray operators and users will be made aware of these provisions and held accountable for them.

Leanne E.S. Cobb, RSO

11/01/2015

Date

VIII. ATTACHMENTS

A. Intraoral Dental X-ray Machine Training Outline

1. Registration of x-ray machines
2. ALARA
3. X-ray Machine Labels
4. Licensing of x-ray machine operators
5. Required Postings
 - a) X-ray machine registration
 - b) X-ray machine operator license
 - c) Notice to Employee
 - d) Caution or Warning Signs
6. Repair Vendors
7. Security
8. Dosimetry
 - a) Individual Monitoring
 - b) Declaration of Pregnancy
9. X-ray Machine Use
 - a) Operator Position
 - b) Holding Imaging Devices
 - c) Patients Only
 - d) Do Not Practice On Humans
 - e) Persons in Room During Exposure
 - f) Broken Machines
 - g) Machines That Will Not Turn Off
 - h) Lead Aprons For Patients And Fetuses
 - i) Reporting Overexposures
10. Radiation Safety Manual, Machine Operator Manual and Procedure storage locations

B. Notice to Employees for Dental Clinic



**FLORIDA DEPARTMENT OF HEALTH
NOTICE TO EMPLOYEES**



**STANDARDS FOR PROTECTION AGAINST RADIATION;
NOTICES, INSTRUCTIONS AND REPORTS TO WORKERS; INSPECTIONS**

POSTING REQUIREMENT

THIS NOTICE MUST BE POSTED IN PLACES THAT PERMIT EMPLOYEES IN A RESTRICTED AREA TO SEE A COPY ON THE WAY TO OR FROM THEIR PLACE OF EMPLOYMENT.

The Department of Health has established standards for protection against radiation hazards in Chapter 64E-5, Florida Administrative Code.

YOUR EMPLOYER IS REQUIRED TO:

- Post or provide you a copy of the Department of Health rules and operating procedures that apply to your work and explain them to you.
- Apply the rules to work involving radiation sources.
- Post or provide you any Notice of Violation involving radiological working conditions, proposed civil penalties, and orders.

YOU ARE REQUIRED TO:

- Become familiar with the rules and the operating procedures that apply to your work.
- Observe the requirements to protect yourself and your co-workers.

WHAT IS IN THESE RULES:

- Limits on exposure to radiation and radioactive material in restricted and unrestricted areas
- Actions to take after accidental exposure
- Personnel monitoring, surveys, and equipment
- Caution signs, labels, and safety interlocks
- Exposure records and reports
- Options for workers about Department of Health inspections
- Related matters

REPORTS ON RADIATION EXPOSURE

Your employer must give you a written report if you receive an exposure above the limits in the rules or in the license. The maximum limits for exposure to employees are in Part III of the rules. However, your employer should keep your radiation exposure as low as reasonably achievable.

If you work where personnel monitoring is required:

- Your employer must give you a written annual report of your radiation exposures.
- Your employer must give you a written report of your radiation exposures when you terminate employment.

INSPECTIONS

Representatives of the Department of Health inspect all licensed and registered activities. Any worker or worker representative who believes that there is a violation of Chapter 404, Florida Statutes; Chapter 64E-5, Florida Administrative Code; or the terms of the employer's license or registration can request an inspection by contacting the Bureau of Radiation Control, Bin C21, 4052 Bald Cypress Way, Tallahassee, FL 32399-1741 (850) 245-4266. The request must state specific reasons for the inspection. During inspections, Department of Health inspectors can confer privately with workers and any worker can bring to the attention of the inspectors any past or present condition that they believe contributed to or caused any violation.

Copies FAC 64E-5, F.A.C., the registration, operating procedures, any notice of violation about working conditions, penalty orders issued, and responses can be examined at: Building SS-8W, Dental Clinic, Room 231, file drawer labeled Manuals.

C. BRC Information Notice 17 For Dental Registrants

Information Notice Number 17 (November 1997)

For Florida Radiation Machine Registrants

Department of Health, Bureau of Radiation Control

TYPICAL SHIELDING REQUIREMENTS FOR DENTAL REGISTRANTS

The State of Florida administrative rules require radiation machine registrants to adequately shield the x-ray beams and scattered radiation produced by their machines. The purpose of this requirement is to ensure machine operators and members of the general public are not unnecessarily exposed to radiation and are kept below their legal dose limits. Shielding requirements will be determined by this potential exposure to humans and must take into consideration occupancy factors, distance, work load, energy, and direction of the primary beam, and other related factors.

For dental intraoral units (bite wing) a protected position or six-foot distance is required for the operator. Normally, no additional shielding is required for scattered radiation when the walls are equivalent to two thicknesses of drywall (paneling only is not sufficient). Panoramic units incorporate a film holder and a beamstop and do not require shielding. They may be placed in any room or hallway which allows the operator to maintain a four-foot distance from the patient while using the machine.

Additional shielding (three thicknesses of drywall instead of two) is recommended when sharing a wall with another office or tenant where you do not have administrative control. Dental machines shared by two rooms should have the pass-through opening located at the foot end of the rooms so the primary radiation cannot pass directly through the opening. Doors on this pass-through are recommended, not as a specific regulation, but as an extension of the regulations requiring either distance or shielding.

Keep in mind that film badges are not required unless there is the potential to receive 10 percent of the annual permissible dose. This should not be the case in dental facilities where operators remain at a safe distance or in a protected position.

If you have questions or need guidance, please contact this office at:

Department of Health
Bureau of Radiation Control, Radiation Machine Program
705 Wells Rd Ste 300, Orange Park, Florida 32073
Phone: (904) 278-5730 Fax: (904) 278-5737
www.myFloridaEH.com/radiation

D. Analytical X-ray Machine Training Outline

1. Registration of x-ray machines
2. ALARA
3. X-ray Machine Labels
4. Required Postings
 - a) X-ray machine registration
 - b) Notice to Employee
 - c) Caution or Warning Signs
5. Repair Vendors
6. Security
7. Dosimetry
 - a) Extremity Monitoring for Handheld x-ray machines
 - b) Individual Monitoring
 - c) Declaration of Pregnancy
 - d) Overexposure Reporting
8. Enclosed Cabinet X-ray machine Use
 - a) Shutters and interlocks
 - b) Specimen Placement
 - c) X-ray Machine Cleaning
 - d) Shielding Removal
9. Handheld X-ray Machine Use
 - a) Manufacturer Provided Shielding Use Required
 - b) Holding Imaging Devices
 - c) Only Specimens to be X-ray
 - d) Do Not Practice on Humans
 - e) Transportation and Field Documents
10. Broken Machines
11. Machines That Will Not Turn Off
12. Radiation Safety Manual, Machine Operator Manual and Procedure storage locations

E. Notice to Employees for Analytical X-ray Machine



**FLORIDA DEPARTMENT OF HEALTH
NOTICE TO EMPLOYEES**



**STANDARDS FOR PROTECTION AGAINST RADIATION;
NOTICES, INSTRUCTIONS AND REPORTS TO WORKERS; INSPECTIONS**

POSTING REQUIREMENT

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YOUR EMPLOYER IS REQUIRED TO:

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- Apply the rules to work involving radiation sources.
- Post or provide you any Notice of Violation involving radiological working conditions, proposed civil penalties, and orders.

YOU ARE REQUIRED TO:

- Become familiar with the rules and the operating procedures that apply to your work.
- Observe the requirements to protect yourself and your co-workers.

WHAT IS IN THESE RULES:

- Limits on exposure to radiation and radioactive material in restricted and unrestricted areas
- Actions to take after accidental exposure
- Personnel monitoring, surveys, and equipment
- Caution signs, labels, and safety interlocks
- Exposure records and reports
- Options for workers about Department of Health inspections
- Related matters

REPORTS ON RADIATION EXPOSURE

Your employer must give you a written report if you receive an exposure above the limits in the rules or in the license. The maximum limits for exposure to employees are in Part III of the rules. However, your employer should keep your radiation exposure as low as reasonably achievable.

If you work where personnel monitoring is required:

- Your employer must give you a written annual report of your radiation exposures.
- Your employer must give you a written report of your radiation exposures when you terminate employment.

INSPECTIONS

Representatives of the Department of Health inspect all licensed and registered activities. Any worker or worker representative who believes that there is a violation of Chapter 404, Florida Statutes; Chapter 64E-5, Florida Administrative Code; or the terms of the employer's license or registration can request an inspection by contacting the Bureau of Radiation Control, Bin C21, 4052 Bald Cypress Way, Tallahassee, FL 32399-1741 (850) 245-4266. The request must state specific reasons for the inspection. During inspections, Department of Health inspectors can confer privately with workers and any worker can bring to the attention of the inspectors any past or present condition that they believe contributed to or caused any violation.

Copies of FAC 64E-5, the registration, operating procedures, any notice of violation about working conditions, penalty orders issued, and responses can be examined at: FAU Environmental Health & Safety Building 69 Room 112 561 297 3129

F. DEXA X-ray Machine Training Outline

Machine not in operation.

G. Notice To Employees for DEXA X-ray Machine



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- Post or provide you any Notice of Violation involving radiological working conditions, proposed civil penalties, and orders.

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- Observe the requirements to protect yourself and your co-workers.

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- Actions to take after accidental exposure
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- Exposure records and reports
- Options for workers about Department of Health inspections
- Related matters

REPORTS ON RADIATION EXPOSURE

Your employer must give you a written report if you receive an exposure above the limits in the rules or in the license. The maximum limits for exposure to employees are in Part III of the rules. However, your employer should keep your radiation exposure as low as reasonably achievable.

If you work where personnel monitoring is required:

- Your employer must give you a written annual report of your radiation exposures.
- Your employer must give you a written report of your radiation exposures when you terminate employment.

INSPECTIONS

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**Copies of FAC 64E-5, the registration, operating procedures, any notice of violation about working conditions, penalty orders issued, and responses can be examined at:
FAU Environmental Health & Safety
Building 69 Room 112
561 297 3129**

H. Evaluation Form For Dental Clinic



Environmental Health & Safety Dental Clinic X-ray Evaluation

561 297 3129
ehs@fau.edu

Machine: MF _____ MN _____ SN _____
 mA _____ kVp _____ FAU ID _____
 MF _____ MN _____ SN _____
 mA _____ kVp _____ FAU ID _____

Item	Y	N	NA	Comment
Registration Posted/JR				
Operator License Posted				
Notice to Employees Posted				
Operator Annual Training				
Radiation Safety Manual				
Clinic SOP				
Machine Manual				
SSD > 18 cm ↑ 50 kVp/Collimation Intact				
Timer Reset/No 0 Time Exposure				
Operator Location/Patient Visible/Switch				
Aprons				
Machine Security				
Machine Labeling				
Beam On Indicator				
Tube Stays in Place				
Machine Condition				
Changes Evaluated				

Comment: _____

Surveyor Phone Date

Survey Reviewed With Phone Date

RSO Review Phone Date

Revised 5/2011

I. Evaluation Form For Analytical X-ray Machine



Environmental Health & Safety Analytical X-ray Evaluation

561 297 3129
ehs@fau.edu

Machine: MF _____ MN _____ SN _____
mA _____ kVp _____ FAU ID _____

Machine: MF _____ MN _____ SN _____
mA _____ kVp _____ FAU ID _____

Item	Y	N	NA	Comment
Registration Posted/JR				
Notice to Employees Posted				
Caution/Warning Signs				
Operator/User Approved				
Operator/User Annual Training				
Radiation Safety Manual				
Laboratory SOP				
Machine Manual				
Dosimetry				
Machine Security				
Machine Labeling				
Machine Condition				
Beam On Indicator				
Cabinet Interlocks/Ports Closed				
Cabinet Shielding				
Handheld Shielding				
Changes Evaluated				

Meter: MN _____ SN _____ Cal Date _____ Bkgd _____ cpm-mR/h
Loc1 _____ Exp _____ Loc2 _____ Exp _____ Loc3 _____ Exp _____

Comment: _____

Surveyor Phone Date

Survey Reviewed With Phone Date

RSO Review Phone Date

Revised 5/2011