Name: _____ Date: _____ Team: _____

Lab Experiment # 5

Dose Area Product

Direct Radiography

Purpose

This experiment is designed to evaluate the effects of changes in mAs, kVp, and collimation on both the Dose Area Product (DAP) and the Exposure Index (EI).

Learning Objectives

After completing this lab, you should be able to:

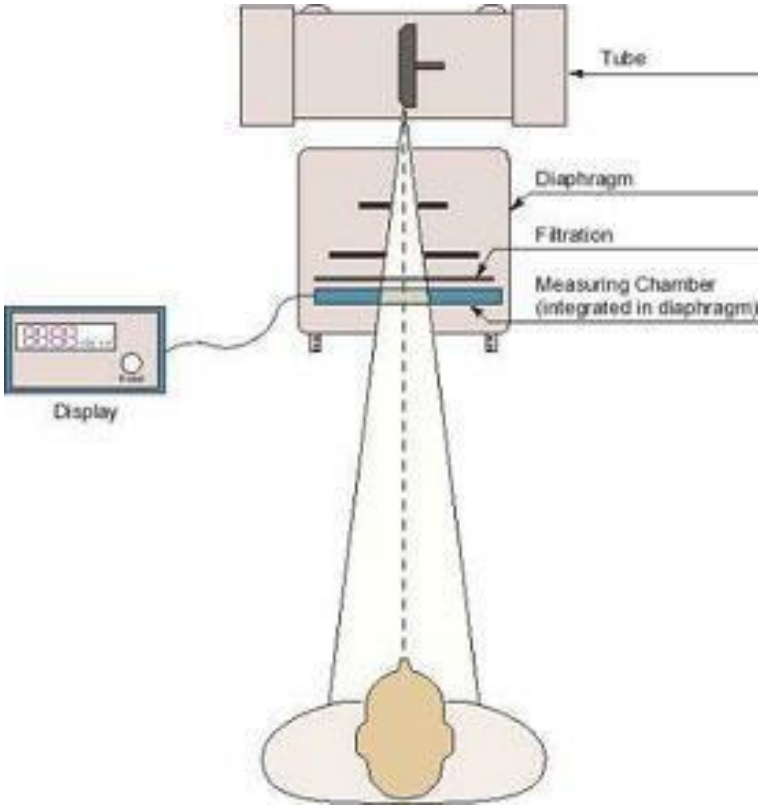
1. Use the laboratory equipment properly.
2. Set up the control console and ceiling tube mount correctly.
3. Function effectively in group work.
4. Perform the experiment independently.
5. Set up the control console or an automatic exposure control system.
6. Explain the common limitations of AEC.
7. Predict the effect of the change in mAs, kVp, and collimation on DAP and EI

Materials Needed

- **35cm x 43 cm FPD image receptor**
- **Knee - phantom**
- Set of radiopaque markers

Pre-Lab Discussion

DAP System



DAP (Dose Area Product) represents the total radiation energy imparted to a patient and is calculated as the absorbed dose multiplied by the irradiated field area, expressed in Gy·cm². Several factors affect DAP: **tube current–time product (mAs)** directly influences dose, so higher mAs increases DAP; **kilovoltage (kVp)** affects both beam quality and dose, with higher kVp generally raising DAP due to more penetrating photons; **field size (collimation)** has a significant impact, since even if the dose remains constant, increasing the exposed area proportionally increases DAP; **source-to-image distance (SID)** alters intensity at the skin but does not change DAP if collimation is adjusted consistently at the patient surface. Because DAP reflects both intensity and irradiated volume, it provides a useful indicator of stochastic risk (like cancer induction probability) rather than localized skin effects, making it an essential tool for radiation protection and quality assurance in radiology.

Experimental Setup

Instructions for Exposure 1-15

1. Place a direct radiography FPD image receptor on the table and set the SID to 40 inches.
2. Place the **natural bone knee** on the tabletop (TT) positioned for an **AP knee** projection with its long axis **parallel** to the long axis of the table.
3. Direct the central ray **perpendicular** at the level ½ inch inferior to the patellar apex and collimate to a 10 x 12 field size and allow room for your radiopaque ID markers to show on the image.
4. Tape the appropriate ID markers onto the tabletop within the collimated light field so they do not obscure any areas of interest.
   (The room, side and exposure number must be labeled on **all** radiographs.)
5. Set the control console to the **MANUAL** mode.
6. Make exposures **1-9** using the settings indicated on the worksheet.
7. Record the mAs, time, and DAP for each exposure. mAs will be displayed on the control console **immediately after each exposure has been completed**. DAP can be found in the unit's log file.
8. Record the TEI and EI

Technique Worksheet

Direct Radiography

The wireless digital (FPD) image receptor can only be handled by an instructor!

	mAs	Collimation		kVp	Image Receptor	Focal Spot	SID	EI/DAP
		inches				Small or large	inches	
1	2	10 x 12		80	DR		40	
2	4	10 x 12		80	DR		40	
3	8	10 x 12		80	DR		40	
4	2	10 x 12		85	DR		40	
5	2	10 x 12		90	DR		40	
6	2	10 x 12		95	DR		40	
7	2	11 x 14		80	DR		40	
8	2	14 x17		80	DR		40	
9	2	5 x 5		80	DR		40	

Worksheet

1 – 3	Is the EI increasing from exposure 1 to 3? Is the DAP increasing from exposure 1 to 3?	
4 – 6	Is the EI decreasing from exposure 4 to 6? Is the DAP increasing from exposure 4 to 6?	
7 – 9	Is the EI decreasing from exposure 7 to 9? Is the DAP increasing from exposure 7 to 9?	