641—40.2(136C) Definitions. The definitions provided in 641—Chapter 37 may also apply to the provisions of this chapter. Additionally, the following definitions set forth below are specific to this chapter.

"Accessible surface" means the external surface of the enclosure or housing of the radiation producing machine as provided by the manufacturer.

"Attenuation block" means a block or stack having dimensions 20 centimeters by 20 centimeters by 3.8 centimeters of type 1100 aluminum alloy or other materials having equivalent attenuation.

"Automatic exposure control" or *"AEC"* (see also "phototimer") means a device that automatically controls one or more technique factors in order to obtain at a preselected location(s) a required quantity of radiation (includes devices such as phototimers and ion chambers).

"C-arm fluoroscope" means a fluoroscopic X-ray system in which the image receptor and the X-ray tube housing assembly are connected or coordinated to maintain a spatial relationship. Such a system allows a change in the direction of the beam axis with respect to the patient without moving the patient.

"Computed radiography" or *"CR"* (see also "DR") means a digital X-ray imaging method in which a photo-stimulable phosphor is used to capture and store a latent image. The latent image is read out by stimulating the phosphor with a laser. Computed radiography systems may use cassettes to house the phosphor, or it may be integrated into a digital radiography system.

"Computed tomography dose index" or *"CTDI"* means the integral from -7T to +7T of the dose profile along a line perpendicular to the tomographic plane divided by the product of the nominal tomographic section thickness and the number of tomograms produced in a single scan, that is:

$$\overline{\text{CTDI}} = \frac{1}{nT}\int_{-7T}^{+7T} D(z)\,dz$$

where:

z = Position along a line perpendicular to the tomographic plane.

D(z)= Dose at position z.

T = Nominal tomographic section thickness.

n = Number of tomograms produced in a single scan.

This definition assumes that:

1. The dose profile is centered around z = 0; and
2. For a multiple tomogram system, the scan increment between adjacent scans is nT.

"Cone beam computed tomography" or *"CBCT"* is a volumetric imaging modality. Volumetric data are acquired using two dimensional digital detector arrays and a cone-shaped (instead of fan-shaped) X-ray beam that rotates around the patient. Reconstruction algorithms can be used to generate images of any desired plane.

"CT conditions of operation" means all selectable parameters governing the operation of a CT X-ray system, including but not limited to nominal tomographic section thickness, filtration, and the technique factors as defined in this chapter.

"CT gantry" means the tube housing assemblies, beam-limiting devices, detectors, and the supporting structures, frames, and covers that hold and enclose these components within a computed tomography system.

"Cumulative air kerma" means the total air kerma accrued from the beginning of an examination or procedure and includes all contributions from fluoroscopic and radiographic irradiation.

"Diagnostic source assembly" means the tube housing assembly with a beam-limiting device attached.

"Digital radiography" or *"DR"* means an X-ray imaging method (or radiography) that produces a digital rather than analog image. "DR" includes both computed radiography (CR) and direct digital radiography (DDR).

"Direct digital radiography" or *"DDR"* (see also "CR" and "DR") means an X-ray imaging method in which a digital sensor, usually incorporating a thin-film transistor, is used to capture an X-ray image. Some

DDR systems use a scintillator to convert X-rays to light and a photodiode array to convert light to charge, while others use a photoconductor to convert X-rays directly to charge, which is stored on the thin-film transistor.

"Dose area product," "DAP," "kerma-area product," or *"KAP"* means the product of the air kerma and the area of the irradiated field and are typically expressed in Gy-cm^2, so do not change with distance from the X-ray tube.

"Dose profile" means the dose as a function of position along a line.

"Entrance exposure rate" means the exposure free in air per unit time at the point where the center of the useful beam enters the patient.

"Field emission equipment" means equipment that uses an X-ray tube in which electron emission from the cathode is due solely to the action of an electric field.

"Filter" means material placed in the useful beam to preferentially absorb selected radiations.

"Fluoroscopically guided interventional," "FGI" or *"special procedures"* means an interventional diagnostic or therapeutic procedure performed via percutaneous or other access routes, usually with local anesthesia or intravenous sedation, that uses external ionizing radiation in the form of fluoroscopy to localize or characterize a lesion, diagnostic site, or treatment site; to monitor the procedure; and to control and document therapy. These procedures could result in extended fluoroscopy examination times and higher doses than typical imaging procedures.

"Fluoroscopic imaging assembly" means a subsystem in which X-ray photons produce a visual image. It includes the image receptor(s) such as the image intensifier and spot-film device; electrical interlocks, if any; and structural material providing linkage between the image receptor and diagnostic source assembly.

"Focal spot (actual)" means the area projected on the anode of the X-ray tube bombarded by the electrons accelerated from the cathode and from which the useful beam originates.

"Focal spot size" means the area of the target or anode that is bombarded by electrons from the cathode of the X-ray tube to produce X-rays. The smaller the focal spot, the better the limited spatial resolution of the X-ray system, especially in magnification mammography.

"Healing arts screening" means the testing of human beings using X-ray machines for the detection or evaluation of health indications for which the individual is considered at high risk when such tests are not specifically and individually ordered by:

1. An individual authorized under subrule 40.4(10), or
2. An individual licensed as a physician in Iowa.

"Image intensifier" means a device, installed in its housing, that instantaneously converts an X-ray pattern into a corresponding light image of higher energy intensity.

"Image receptor" means any device, such as a fluorescent screen, radiographic film, X-ray image intensifier tube, solid-state detector, or gaseous detector that transforms incident X-ray photons either into a visible image or into another form that can be made into a visible image by further transformations. In those cases where means are provided to preselect a portion of the image receptor, "image receptor" means the preselected portion of the device.

"Last-image hold (LIH) radiograph" means an image obtained either by retaining one or more fluoroscopic images, which may be temporarily integrated, at the end of a fluoroscopic exposure or by initiating a separate and distinct radiographic exposure automatically and immediately in conjunction with termination of the fluoroscopic exposure.

"Lead equivalent" means the thickness of lead affording the same attenuation, under specified conditions, as the material in question.

"mA" means milliampere.

"mAs" means milliampere second.

"Multiple tomogram system" means a computed tomography X-ray system that obtains X-ray transmission data simultaneously during a single scan to produce more than one tomogram.

"Nominal tomographic section thickness" means the full width at half-maximum of the sensitivity profile taken at the center of the cross-sectional volume over which X-ray transmission data are collected.

"Peak tube potential," "Kilovolts peak" or *"kVp"* means the maximum value of the potential difference across the X-ray tube during an exposure.

"Phototimer" (see also "automatic exposure control") means a method for controlling radiation exposures to image receptors by the amount of radiation that reaches a radiation-monitoring device(s). The radiation-monitoring device(s) is part of an electronic circuit that controls the duration of time the tube is activated.

"Position indicating device" or *"PID"* means a device on dental X-ray equipment used to indicate the beam position and to establish a definite source-surface (skin) distance. It may or may not incorporate or serve as a beam-limiting device.

"Protective apron" means an apron made of radiation-absorbing materials used to reduce radiation exposure.

"Protective glove" means a glove made of radiation-absorbing materials used to reduce radiation exposure.

"Radiation detector" means a device that in the presence of radiation provides a signal or other indication suitable for use in measuring one or more quantities of incident radiation.

"Radiation therapy simulation system" means a radiographic or fluoroscopic X-ray system intended for localizing the volume to be exposed during radiation therapy and confirming the position and size of the therapeutic irradiation field.

"Radiograph" means an image receptor on which the image is created directly or indirectly by an X-ray pattern and results in a permanent record.

"Radiography" means a technique for generating and recording an X-ray pattern for the purpose of providing the user with an image(s) after termination of the exposure.

"Recording" means producing a retrievable form of an image resulting from X-ray photons.

"Scan" means the complete process of collecting X-ray transmission data for the production of a tomogram. Data can be collected simultaneously during a single scan for the production of one or more tomograms.

"Scan increment" means the amount of relative displacement of the patient with respect to the CT X-ray system between successive scans measured along the direction of such displacement.

"Scan sequence" means a preselected set of two or more scans performed consecutively under preselected CT conditions of operation.

"Scan time" means the period of time between the beginning and end of X-ray transmission data accumulation for a single scan.

"Sensitivity profile" means the relative response of the CT X-ray system as a function of position along a line perpendicular to the tomographic plane.

"Source" means the focal spot of the X-ray tube.

"Source-image receptor distance" or *"SID"* means the distance from the source to the center of the input surface of the image receptor.

"Spot film" means a radiograph that is made during a fluoroscopic examination to permanently record conditions that exist during that fluoroscopic procedure.

"Technique factors" means the following conditions of operation:

1. For capacitor energy storage equipment, peak tube potential in kV and quantity of charge in mAs;
2. For field emission equipment rated for pulsed operation, peak tube potential in kV, and number of X-ray pulses;
3. For CT X-ray systems designed for pulsed operation, peak tube potential in kV, scan time in seconds, and either:
   A. Tube current in mA, X-ray pulse width in seconds, and the number of X-ray pulses per scan, or
   B. The product of tube current, X-ray pulse width, and the number of X-ray pulses in mAs;
4. For CT X-ray systems not designed for pulsed operation, peak tube potential in kV, and either tube current in mA and scan time in seconds or the product of tube current and exposure time in mAs and the scan time when the scan time and exposure time are equivalent; and
5. For all other equipment, peak tube potential in kV and either tube current in mA and exposure time in seconds or the product of tube current and exposure time in mAs.

"Tomogram" means the depiction of the X-ray attenuation properties of a section through the body.

"Tomographic plane" means that geometric plane that is identified as corresponding to the output tomogram.

"Tomographic section" means the volume of an object whose X-ray attenuation properties are imaged in a tomogram.

"Useful beam" means the radiation emanating from the tube housing port or the radiation head and passing through the aperture of the beam-limiting device when the exposure controls are in a mode to cause the system to produce radiation.

"Visible area" means that portion of the input surface of the image receptor over which incident X-ray photons are producing a visible image.

"X-ray control" or *"control panel"* means a device that controls input power to the X-ray high-voltage generator and the X-ray tube, including equipment such as timers, phototimers, automatic brightness stabilizers, and similar devices that control the technique factors of an X-ray exposure.

"X-ray equipment" or *"equipment"* means an X-ray system, subsystem, or component thereof. Types of X-ray equipment are as follows:

1. "Mobile X-ray equipment" means X-ray equipment mounted on a permanent base with wheels or casters for moving while completely assembled.
2. "Portable X-ray equipment" means X-ray equipment designed to be hand-carried but used with a tripod or other stabilization mechanism so the operator is not holding the equipment during exposure.
3. "Stationary X-ray equipment" means X-ray equipment that is installed in a fixed location.
4. "Handheld X-ray equipment" means X-ray equipment designed by the manufacturer to be handheld by the operator during the exposure. X-ray equipment designed without a back-scatter shield is prohibited.

"X-ray exposure control" means a device, a switch, a button, or similar means by which an operator initiates or terminates the radiation exposure. The X-ray exposure control may include such associated equipment as timers and backup timers.

"X-ray field" means that area of the intersection of the useful beam and any one of the set of planes parallel to and including the plane of the image receptor, whose perimeter is the locus of points at which the exposure rate is one-fourth of the maximum in the intersection.

"X-ray high-voltage generator" means a device that transforms electrical energy from the potential supplied by the X-ray control to the tube operating potential. The device may also include means for transforming alternating current to direct current, filament transformers for the X-ray tube(s), high-voltage switches, electrical protective devices, and other appropriate elements.

"X-ray system" means an assemblage of components for the controlled production of X-rays. It includes minimally an X-ray high-voltage generator, an X-ray control, a tube housing assembly, a beam-limiting device, and the necessary supporting structures. Additional components that function with the system are considered integral parts of the system.

"X-ray table" means a patient support device with its patient support structure (tabletop) interposed between the patient and the image receptor during radiography or fluoroscopy. This includes but is not limited to any stretcher equipped with a radiolucent panel and any table equipped with a cassette tray (or bucky), cassette tunnel, image intensifier, or spot-film device beneath the tabletop.

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