

## **902 KAR 100:155. Particle accelerator.**

RELATES TO: KRS 211.842-211.852, 211.990(4)

STATUTORY AUTHORITY: KRS 194.050, 211.090, 211.844

NECESSITY, FUNCTION, AND CONFORMITY: The Cabinet for Human Resources is authorized by KRS 211.844 to provide by administrative regulation for the registration and licensing of the possession or use of sources of ionizing or electronic product radiation and the handling and disposal of radioactive waste. The purpose of this administrative regulation is to provide radiation safety requirements for particle accelerator operations.

Section 1. Applicability. The requirements in this administrative regulation apply to the use of particle accelerators by persons registering the machines under the provisions of these administrative regulations. The requirements of this administrative regulation are in addition to, and not in substitution for, other applicable provisions of these administrative regulations.

Section 2. Equipment. (1) A label bearing essentially the words "CAUTION - RADIATION - THIS MACHINE PRODUCES RADIATION WHEN ENERGIZED" shall be placed near switches which energize portions of the machine. Labels shall use the conventional colors (magenta or purple on yellow background) and bear the conventional radiation symbol.

(2) Apparatus utilized in beam alignment procedures shall be designed in a way that radiation greater than limits prescribed in 902 KAR 100:020 shall not strike the operator.

(3) A switch or device which may cause the radiation machine to produce radiation if actuated shall be located on a control panel or console, and shall cause a warning light immediately adjacent to the switch or device to light; this light shall remain lit if, and only if, the associated control circuit is energized.

(4) Locations designated as high radiation areas, and entrances to the locations shall be equipped with easily observable flashing or rotating red or magenta warning lights that operate automatically if, and only if, radiation is being produced or may be produced.

(5) Each entrance into a target room or other high radiation area shall be provided with a safety interlock designed to terminate radiation production for the possible modes of machine operation under conditions of barrier penetration.

(6) Only a device on the accelerator control console shall be used to turn the accelerator beam on and off. The safety interlock system shall not be used to turn off the accelerator beam, except in an emergency. If the interlock system does turn off the accelerator, it shall not be possible to resume operation without resetting the accelerator "ON" device at the control console.

(7) Safety interlocks shall not be dependent upon the operation of a single circuit; i.e., they shall be of redundant or fail-safe design. Each safety interlock shall be on a circuit which shall allow it to operate independently of other safety interlocks.

(8) A scram button or other emergency power cutoff switch shall be located and easily identifiable in high radiation areas. The cutoff switch shall include a manual reset, so that the accelerator cannot be restarted from the accelerator console without resetting the cutoff switch.

(9) Circuit diagrams of the accelerator and the associated interlock systems shall be kept current and maintained for inspection by the cabinet and shall be available to the operator.

(10) A lock shall be provided on the control panel or console.

(11) Instrumentation, readouts, and controls on the particle accelerator control console shall be clearly identified and easily discernible.

(12) Safety interlocks shall be designed so that a defect or component failure in the safety interlock system prevents operation of the accelerator.

Section 3. Administrative Responsibilities. (1) A person at each facility shall be appointed as the radiation safety officer, and shall be delegated responsibility for ensuring the following:

(a) Establishing and maintaining operational procedures so that the radiation dose received by a person is as low as reasonably achievable and below the maximum permissible dose as is practical;

(b) Instructing personnel who work with or near radiation producing machines, in radiation safety practices;

(c) Maintaining a system of personnel monitoring;

(d) Arranging for establishment of radiation control areas, including placement of appropriate radiation warning signs and devices;

(e) Providing for radiation safety inspection of radiation producing machines on a routine basis;

(f) Reviewing modifications to apparatus, shielding, and safety interlocks;

(g) Investigating and reporting to proper authorities excessive exposure to personnel and taking remedial action;

(h) Being familiar with applicable administrative regulations for the control of ionizing radiation;

(i) Terminating operations at the facility because of radiation safety considerations; and

(j) Maintaining records of these actions to document compliance with these administrative regulations.

(2) No individual shall be permitted to act as an operator of an accelerator until the person has:

(a) Received training in radiation safety and has been approved by the radiation safety officer; and

(b) Demonstrated competence to use the accelerator, related equipment, and radiation survey instruments to be employed.

(3) The registrant shall ensure that each operator shall:

(a) Keep radiation exposure to himself and to others as low as practical;

(b) Be familiar with safety procedures as they apply to each machine;

(c) Wear personnel monitoring devices, if applicable; and

(d) Notify the radiation safety officer of conditions or situations which may have resulted in, or threatens to result in, unnecessary radiation exposure.

(4) The registrant shall establish a radiation safety committee to approve in advance, proposals for uses of particle accelerators, if deemed necessary by the cabinet.

(5) A registrant authorized to use a particle accelerator in the healing arts shall:

(a) Appoint a medical committee of at least three (3) members to evaluate proposals for research, diagnostic, and therapeutic use of a particle accelerator if deemed necessary by the cabinet. Membership of the committee shall include physicians expert in internal medicine, hematology, therapeutic radiology, and a person experienced in depth dose calculations and protection against radiation;

(b) The individuals designated as users have substantial training and experience in deep therapy technique, or in the use of particle accelerators to treat humans; and

(c) An individual designated as a user is a physician.

(6) The radiation safety committee or the radiation safety officer shall have the authority to terminate the operations at a particle accelerator facility if this action is deemed necessary to minimize danger to public health and safety or property.

Section 4. Operating Procedures. (1) Written operating procedures pertaining to radiation safety shall be established for each accelerator facility.

(2) Written emergency procedures pertaining to radiation safety shall be established and posted in a conspicuous location. These shall list the telephone number(s) of the radiation safety officer and shall include the following actions to be taken if a known, or suspected, accident involv-

ing radiation exposure occurs:

(a) Notifying radiation safety officer; and

(b) Arrange for medical examination.

(3) The registrant shall assure that operators and other appropriate personnel are familiar with and have been given a copy of the written operating and emergency procedures pertaining to radiation safety. Each operator shall demonstrate an understanding of these procedures and the applicable requirements of 902 KAR 100:020 and 902 KAR 100:165. These procedures shall be maintained at the accelerator control panel.

(4) Particle accelerators shall be secured if not in operation to prevent unauthorized use.

(5) The registrants shall assure that personnel do not expose a part of their body to the radiation beam.

(6) If it is necessary to intentionally alter safety devices, e.g., bypassing interlocks or removing shielding action shall be:

(a) Specified in writing and posted on the control console and at each entrance requiring a safety interlock as required by this administrative regulation so that other persons know the existing status of the machine;

(b) Terminated as soon as possible; and

(c) Authorized by the radiation safety committee or radiation safety officer.

(7) Accelerators shall not be left unattended while energized.

(8) Safety devices shall be tested for proper operation at intervals not to exceed three (3) months.

(9) Records of personnel monitoring results and safety device tests shall be maintained for inspection by the cabinet.

(10) Appropriate, portable radiation monitoring equipment shall be available at the accelerator facility, properly maintained and calibrated, and sensitive to those radiations being monitored. The monitoring equipment shall be tested for proper operation and calibrated at intervals not to exceed one (1) year and after each servicing and repair.

(11) Radiation levels in high radiation areas shall be continuously monitored. The monitoring devices shall be electrically independent of the accelerator control and safety interlock systems and capable of providing a readout at the control panel. Area monitors shall be calibrated at intervals not to exceed one (1) year and after each servicing and repair.

(12) Personal radiation dosimeters that measure the expected radiations and are of sufficient range to be useful under normal and accident conditions shall be worn by persons designated by the radiation safety officer.

(13) Before a new installation is placed in routine operation, a radiation protection survey shall be made by a qualified expert.

(14) A radiation protection survey shall be performed by a qualified expert if changes have been made in shielding, operation, equipment, or occupancy of adjacent areas, and periodically to check for unknown changes and malfunctioning equipment.

(15) Records of radiation protection surveys, inspections, and maintenance performed on the accelerator and related components shall be kept current and on file at each accelerator facility, and maintained for inspection by the cabinet. (1 Ky.R. 419; eff. 2-5-75; Am. 12 Ky.R. 1416; eff. 3-4-86; 18 Ky.R. 1574; eff. 1-10-92.)