



## Ohio Administrative Code

### Rule 3701:1-68-05 Non-medical particle accelerator systems.

Effective: August 15, 2017

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In addition to the applicable rules in this chapter and Chapter 3701:1-38 of the Administrative Code, handlers of particle accelerator systems shall comply with the following requirements:

(A) Radiation-generating equipment used for particle acceleration shall meet the following equipment standards:

(1) All safety instrumentation, readouts, and controls on the particle accelerator control console shall be clearly identified and easily discernible.

(2) Each safety interlock shall be on a circuit which allows it to operate independently of all other safety interlocks.

(3) All safety systems or interlocks shall be designed so that any defect or component failure in the safety interlock system prevents production of radiation by the accelerator.

(4) If a safety interlock system has been tripped, it shall only be possible to resume operation of the particle accelerator by manually resetting controls at the position where the safety interlock has been tripped, and at the control console.

(5) Each particle accelerator shall bear a warning label on the control console which cautions individuals that radiation is produced when it is energized, and any other warning label required by rules adopted pursuant to Chapter 3701:1-38 of the Administrative Code.

(B) Handlers of particle accelerator systems shall comply with the following radiation safety requirements:

(1) Each particle accelerator installation shall be provided with such shielding as is necessary to assure compliance with the applicable rules adopted pursuant to Chapter 3701:1-38 of the



Administrative Code.

(2) Each entrance into a target room or other high radiation area shall be provided with a safety interlock that shuts down the machine in the event of any barrier penetration.

(3) Each high radiation area shall have an audible and visual signal which shall be activated for at least fifteen seconds prior to the possible creation of such a high radiation area. Such signals shall be clearly discernible in all high radiation areas.

(4) Each location designated as a high radiation area, and each entrance to such location, shall be equipped with visible signals that illuminate when, and only when the high-voltage portion of the machine is being energized.

(5) An emergency power cutoff switch shall be located and easily identifiable in all high radiation areas and shall include a manual reset so that the accelerator cannot be restarted from the accelerator control panel without resetting the cutoff switch.

(6) Appropriate portable monitoring equipment, which is operable and has been appropriately calibrated for the types of radiation being produced, shall be available at each particle accelerator facility. Such equipment shall be calibrated at intervals not to exceed one year and after each servicing and repair.

(7) The handler shall not permit any individual to operate a particle accelerator system unless, at all times during operations, each operator is supplied with and wears an appropriate direct reading dosimeter and personnel dosimeter. Analog pocket dosimeters shall be recharged at the start of each shift. Electronic dosimeters shall be battery-tested at the beginning of each shift. Each personnel dosimeter shall be assigned to and worn by only one individual and the handler shall assure that:

(a) Direct reading dosimeters are read and exposures are recorded at the beginning and end of each shift.

(b) If an individual's pocket dosimeter is found to be off-scale, or the electronic personnel dosimeter reads greater than two millisieverts (two hundred mrem), the individual's personnel dosimeter must



be sent for processing within twenty-four hours. In addition, the individual may not resume work associated with the use of a particle accelerator system until a determination of the individual's radiation exposure has been made. This determination must be made by the individual responsible for radiation protection (IRRP) or the IRRP's designee. The results of this determination must be recorded.

(c) Personnel dosimeters shall be exchanged monthly unless the IRRP has performed an evaluation that indicates a longer frequency is adequate; in this instance the frequency shall not exceed three months.

(d) If a personnel dosimeter is lost or damaged, the worker shall cease work immediately until a replacement personnel dosimeter is provided and the exposure is calculated for the time period from issuance to loss or damage of the personnel dosimeter. This calculation must be made by the IRRP or the IRRP's designee. The results of the calculated exposure and the time period for which the personnel dosimeter was lost or damaged must be recorded:

(i) After replacement, each personnel dosimeter must be returned to the supplier for processing within fourteen calendar days of the end of the monitoring period; or

(ii) In circumstances that make it impossible to return each personnel dosimeter in fourteen calendar days, such circumstances must be recorded.

(8) The safety interlock system shall not be used to turn off the particle accelerator beam, except in an emergency or when testing of the safety interlock system.

(9) If, for any reason, it is necessary to intentionally bypass a safety interlock or interlocks, such action shall be:

(a) Authorized by the IRRP;

(b) Recorded in a permanent log;

(c) Posted as a written notice at the accelerator control panel; and



(d) Terminated as soon as possible.

(10) The particle accelerator shall be secured when not in operation to prevent unauthorized use.

(C) In addition to the requirements specified in rule 3701:1-68-02 of the Administrative Code, handlers of particle accelerator systems shall comply with the following quality assurance requirements:

(1) A health physicist or a radiation expert, with education and experience acceptable to the director, shall be consulted in the design of a particle accelerator installation and called upon to perform a radiation survey when the accelerator is first capable of producing radiation.

(2) A radiation shielding survey shall be performed and recorded by a health physicist or qualified expert, with education and experience acceptable to the director, when changes have been made in shielding, operation, equipment, or occupancy of adjacent areas.

(3) All surveys shall be made in accordance with the written procedures established by a health physicist or radiation expert, with education and experience acceptable to the director.

(4) Portable monitoring equipment shall be tested for proper operation and the results recorded daily.

(5) Particle accelerator systems shall be evaluated and the results recorded at least every three months not to exceed fourteen weeks, by individuals qualified according to paragraph (I) of rule 3701:1-68-02 of the Administrative Code, unless the system has been locked out and tagged "DO NOT USE" and is under administrative control of the IRRP:

(a) The evaluation shall verify:

(i) Proper functioning of interlocks and warning devices; and

(ii) Each label is legible and properly affixed in the appropriate location.



(b) In the event the safety equipment is operating improperly, it shall be immediately reported to the IRRP and shall be repaired or replaced and never bypassed so as to enable radiation production.

(6) Radiation levels in all 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.

(7) A copy of the current operating and the emergency procedures shall be maintained at the particle accelerator system control panel.

(D) The IRRP shall be qualified in accordance with paragraph (B)(14) of rule 3701:1-68-01 of the Administrative Code and paragraph (I) of rule 3701:1-68-02 of the Administrative Code. In addition to the requirements of paragraph (F) of rule 3701:1-68-02 of the Administrative Code, the specific duties and authority of the IRRP for particle accelerator systems include, but are not limited to:

(1) Termination of the operations if such action is deemed necessary to minimize danger to public health and safety.

(2) The development and maintenance of a particle accelerator handbook that describes the electrical circuits and the associated interlock systems. This handbook shall be kept current as to any changes in the system.

(3) Documenting that individuals have demonstrated competency in the use of the particle accelerator, related equipment, and radiation survey instruments that will be used to monitor the particle accelerator at that facility.