Queensland Government

Radiation Safety Act 1999

RADIATION SAFETY STANDARD HR005:2010

Standard for radiation apparatus used to carry out intra-oral dental diagnostic radiography

Preface

This radiation safety standard, HR005:2010 *Standard for radiation apparatus used to carry out intra-oral dental diagnostic radiography* is made under section 16 of the *Radiation Safety Act 1999*, and establishes the minimum safety criteria for radiation apparatus used to carry out intra-oral dental diagnostic radiography involving the irradiation of humans. Compliance with this standard will assist possession licensees in ensuring that health and safety of persons are not adversely affected by exposure to radiation during intra-oral dental diagnostic radiography procedures.

This radiation safety standard, which is based on information derived from reputable sources such as Standards Australia and the Australasian College of Physical Scientists and Engineers in Medicine, was prepared after extensive consultation with industry and licensees.

By ensuring compliance with this radiation safety standard, radiation safety in intra-oral dental diagnostic practices across Queensland will be enhanced. Queensland Health will also ensure that the standard is reviewed periodically to assure its currency and its appropriateness for intra-oral dental diagnostic radiation apparatus.

I, Paul Lucas, Deputy Premier and Minister for Health, pursuant to section 16(1) of the *Radiation Safety Act 1999*, make the radiation safety standard HR005:2010 *Standard for radiation apparatus used to carry out intra-oral dental diagnostic radiography*, for the purposes of the Act, and repeal the previous standard HR005:2004 *Standard for radiation apparatus used to carry out intra-oral dental diagnostic radiography*

SIGNED

PAUL LUCAS MP
Deputy Premier
Minister for Health

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Contents

Standard for radiation apparatus used to carry out intra-oral dental diagnostic radiography

Section 1 – General

1.1 Scope

This radiation safety standard sets out the minimum requirements for ionising radiation apparatus that is used to carry out intra-oral dental diagnostic radiography on humans.

1.2 Expiry

This radiation safety standard expires on 1 September 2020.

1.3 Definitions

In this standard –

"coefficient of variation" means the ratio of the sample standard deviation to the mean value of a series of measurements.

"indicated values" means values displayed by the X-ray system following an X-ray exposure.

"intra-oral dental diagnostic radiography" means radiography of the dento-maxillofacial region with radiation apparatus intended for use with intra-oral image receptors.

"kVp" (X-ray tube voltage) means the potential difference, applied to an X-ray tube between the anode and the cathode, which is expressed by its peak value in kilovolts (kVp).

"leakage air kerma" means ionising radiation which has passed through the protective shielding of a radiation source during loading. Leakage air kerma is usually expressed in milligray (mGy) or microgray (μGy).

"loading" means the act of supplying electrical energy to the anode of an X-ray tube.

"mAs" (current time product) means the electric charge resulting from the loading of an X-ray tube, expressed in milliampere seconds (mAs), as the product of the mean X-ray tube current in milliamperes and the duration of the loading in seconds.

"set values" means settings selected by the system operator prior to an X-ray exposure.

"standard bite-wing settings" means the most commonly used settings used to obtain bite-wing images when using the radiation apparatus.

Section 2 - Standard – Intra-oral Dental Diagnostic Radiation Apparatus

Test	Compliance Test	Criteria for Passing the Test
Radiation output		
1	Reproducibility	The coefficient of variation of 5 consecutive radiation output measurements, obtained using a system operating at standard bite-wing settings, must not exceed 0.05.
2	Linearity of air kerma	The following conditions must be met for each of the available kVp options, measured using at least three exposure settings including the lowest and the highest clinically used: $\frac{\left\lvert \frac{K_1}{Q_1} - \frac{K_2}{Q_2} \right\rvert}{\frac{K_1}{Q_1} + \frac{K_2}{Q_2}} \leq 0.1$ for values of Q_1 and Q_2 where $0.5 \leq \frac{Q_2}{Q_1} \leq 2$; and/or $\frac{\left\lvert \frac{K_1}{I_1 t_1} - \frac{K_2}{I_2 t_2} \right\rvert}{\frac{K_1}{I_1 t_1} + \frac{K_2}{I_2 t_2}} \leq 0.1$ for values of $I_1 t_1$ and $I_2 t_2$ where $0.5 \leq \frac{I_2 t_2}{I_1 t_1} \leq 2$; where K_1 , K_2 are the measured values of air kerma; Q_1 , Q_2 are the set values of mAs; I_1 , I_2 are the set values of, or nominal, X-ray tube currents; t_1 , t_2 are the set values of the irradiation time, if available [Note]. Note: In cases where the actual set values or the nominal values of mAs or irradiation time are not available, exposures must vary in a manner consistent with the markings on the control panel (e.g. air kerma increases as larger tooth settings are selected).
3	Irradiation time	The irradiation time for standard bite-wing settings must not exceed 1.0 second.

Test	Compliance Test	Criteria for Passing the Test
4	Entrance skin air kerma	For standard bite-wing settings, the air kerma at the open end of the beam applicator must not exceed 3.5 mGy.
5	Beam quality - half value layer	The total filtration must be such that the measured half-value layer: (a) is not less than 1.5 millimetres of aluminium for each of the available kVp options on the radiation apparatus; and (b) increases with increases in kVp.
Leakage air kerma		
6	X-ray source assembly	The leakage air kerma averaged over any area of 100 square centimetres at one metre from the focal spot must not exceed 0.25 mGy in one hour with the X-ray tube operating at the maximum rated voltage and the maximum rated continuous current.
Control panel		
7	Supply indicator	The supply indicator on the control panel must be visible and must clearly indicate when the main switch is in the 'ON' position and the control panel is energised.
8	Loading indicator	Loading must be indicated by a visible signal. Additionally, an audible signal must be provided which indicates either the duration or the instant of termination of loading.
9	Initiation of loading	Each loading must be initiated and maintained by means of a control requiring continuous actuation by the operator.
10	Exposure switch position	The exposure switch must be arranged so that the radiation apparatus can be operated from either: (a) a distance of at least 2 metres from the X-ray tube; or (b) from behind a protective barrier.
11	Radiation warning sign	The radiation apparatus must be marked on the control panel with a label incorporating the following information: • radiation warning sign (trefoil) • the words 'caution' or 'warning' • words to the general form of 'X-rays produced when energised' The symbol and lettering must be black on a yellow background.

Test	Compliance Test	Criteria for Passing the Test
Beam limiting device		
12	Minimum focus to skin distance	The minimum focus to skin distance must not be able to be less than 200 millimetres.
13	Maximum dimension of X-ray field	The maximum dimension of the X-ray field at the patient end of the beam applicator must not exceed 60 millimetres.
14	Alignment of the X-ray field	The central axis of the X-ray beam must lie within 3 millimetres of the central axis of the applicator measured at the patient end of the applicator.
Tube stability		
15	Tube stability	The tube must remain stationary during loading.