

Medical electrical equipment —

Part 3: Particular requirements for performance —

Section 3.1 Methods of declaring functional performance characteristics of medical electron accelerators in the range 1 MeV to 50 MeV —

Supplement 1: Guide to functional performance values

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Health Care Standards Policy Committee (HCC/-) to Technical Committee HCC/81, upon which the following bodies were represented:

- Association of X-ray Equipment Manufacturers (BEAMA Ltd.)
- British Institute of Radiology
- College of Radiographers
- Department of Health
- Department of Trade and Industry (National Physical Laboratory)
- Institute of Physical Sciences in Medicine
- Institution of Electrical Engineers
- National Radiological Protection Board
- Royal College of Radiologists

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National foreword

This Supplement to Section 3.1 of BS 5724 has been prepared under the direction of the Health Care Standards Policy Committee. It is identical with IEC Publication 977, including amendment 1:2000, published in 1989 by the International Electrotechnical Commission (IEC).

The start and finish of text introduced or altered by IEC amendment 1:2000 are indicated by tags $\boxed{A_1}$ $\boxed{A_1}$. Tags indicating changes to text carry the number of the amendment. For example, text altered by IEC amendment 1 is indicated by $\boxed{A_1}$ $\boxed{A_1}$.

This Particular Standard, which is for use in conjunction with BS 5724-2.1 and BS 5724-3.1, gives guidance on the values of the functional performance characteristics of medical electron accelerators which may be declared by the manufacturer. It also gives recommendations to manufacturers for the values to be declared in accordance with BS 5724-3.1.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

Additional information. The following print types are used in this standard.

Terms defined in clause 2 of BS 5724-1: SMALL CAPITALS.

For the purposes of this British Standard, any references to IEC page numbers in the text should be ignored.

Textual errors. When adopting the text of the International Standard, the textual errors listed below were discovered. They have been marked in the text and have been reported to IEC in a proposal to amend the text of the International Standard.

Section 2. General, type tests

In 2.1 (page 3), paragraph 3, last line, “maxi” should be replaced by “max” and “mini” should be replaced by “min”.

Format for presentation of functional performance values: Abbreviation of statement in disclosure standard

In 7.2.1 (page 10), line 1, base depth should be replaced by “BASE DEPTH”.

2.2 Rationale for functional performance values suggested by the Working Group

In 5.1 (page 16), line 3, “value of $\bar{R}$ ” should be replaced by “value, $\bar{R}$,”.

In 7.1.1 (page 17), paragraph 1, line 4, “flattening FILTER” should be replaced by “FIELD-FLATTENING FILTER”; this correction should also be made in paragraph 2, line 4, and in paragraph 3, line 3.

In 7.1.1 (page 17), paragraph 2, line 3, “AXIS dose” should be replaced by “AXIS”.

In 7.1.1 (page 17), paragraph 4, line 4, “therapy” should be replaced by “RADIOTHERAPY”.

In 7.2.1 (page 18), paragraph 3, line 7, “plane” should be inserted after “BASE DEPTH”.

In 10.2 (page 21), paragraph 4, line 2, “scatter” should be replaced by “scatters” and in line 3 “bend” should be replaced by “bends”. In line 4, “RADIATION FIELD defining aperture” should be replaced by “BEAM LIMITING SYSTEM”.

In Table 1 (page 27), section A, column 1, “12” should be replaced by “11”; and in section B, column 2, “Dependence on equipment position” should be replaced by “Dependence on angular positions” and, in column 1, “6.1” should be replaced by “6.2.2” and “6.1.2” should be replaced by “7.1.2”.

Section 3. Acceptance tests

3.1 Summary of suggested test methods for MEDICAL ELECTRON ACCELERATOR acceptance

In clause 5.1 (page 27), line 1, " $\bar{R}$ " should be replaced by " R "; after line four, the first equation for s should be deleted.

In clause 5.2 (page 27), paragraph 2, line 5, the first reference to " $\bar{R}$ " should be replaced by " R ".

In 5.6.2 (page 27), line 2, "a 4 Gy" should be replaced by "4 Gy".

In 7.2.2 (page 30), lines 3 and 4, the text "on the major axis of the RADIATION FIELD parallel to the GANTRY axis and" should be replaced by "on a major axis of the RADIATION FIELD at".

In 8.1.3 (page 31), line 2, "alternatively" should be replaced by "alternately".

In 10.1 b) (page 32), line 4, "surfaces" should be replaced by "surface".

In 10.2 (page 32), lines 1 and 2, "LIGHT FIELD-INDICATORS" should be replaced by "ISOCENTRE position indicators".

Section 4. Periodic tests

4.1 Suggested set of periodic test methods and test conditions

In the table (page 44), last column, last line, "each" should be inserted between "ENERGY" and "periodic"; also, on page 47, second column, first line, "LIGHT FIELD indication" should be replaced by "ELECTRON FIELD indication (LIGHT FIELD)".

The first edition of BS 5724-3.1:1990 omitted two English language pages of IEC 60977:1989. These have been reintroduced with the incorporation of IEC amendment 1:2000.

This publication does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 55 and a back cover.

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Section 1. Introduction

The guidelines given in this report are recommendations both to manufacturers and to USERS. They provide guidance to manufacturers on the needs of radiotherapists in respect of the performance of ELECTRON ACCELERATORS and they provide guidance to USERS wishing to check the manufacturer's declared performance characteristics, to carry out acceptance tests and to check periodically the performance throughout the life of the equipment.

IEC Publication 601-1 (1977) is a general standard for the safety of medical electrical equipment¹⁾. It is supplemented by IEC Publication 601-2-1, a standard which lays down particular requirements for MEDICAL ELECTRON ACCELERATORS in the range of 1 MeV to 50 MeV, titled Section 1: General; Section 2: Radiation safety for equipment; Section 3: Electrical and mechanical safety for equipment. In addition, IEC Publication 976 has been issued as a disclosure standard. It is a standard which standardizes methods of declaring the MEDICAL ELECTRON ACCELERATOR functional performance characteristics. It standardizes the type test conditions and type test methods to which manufacturers' declared values of functional performance relate.

A format for the presentation of functional performance values is contained in IEC Publication 976 as Appendix B. It is repeated herein as **2.1**, with the addition of a set of suggested values which reflects the need for precision in RADIOTHERAPY and the knowledge of what is reliably achievable technically.

A corresponding rationale for the suggested values is presented in **2.2**.

In order to check whether each individual machine at the time of installation performs in a manner consistent with the set of functional performance values declared by the manufacturer based upon his type test data, it is customary to perform a series of acceptance tests at the USER'S site before the machine is put into full medical use. Because of limitations of time and test equipment, this series of acceptance tests is usually less extensive than the type tests specified in the disclosure standard, IEC Publication 976.

3.1 contains a summary of suggested test methods for machine acceptance. These are consistent with the test methods of IEC Publication 976 but have been presented in a form which may be more suitable for use in hospitals. For reasons of economy and time, the USER may prefer to have a more limited but still standardized test performed at the time of installation of the equipment.

3.2 contains a set of suggested acceptance (commissioning) test conditions. It should be emphasized that these test conditions are presented only as examples and that a quite different set of test conditions may still be needed for the purpose of displaying the functional performance characteristics of the individual machine.

During the working life of the MEDICAL ELECTRON ACCELERATOR, periodic tests are usually conducted by the USER to check whether the functional performance of the machine is satisfactory. Because the available machine time is limited, a highly abbreviated set of test conditions is essential. Individual tests should not be repeated any more or less frequently than can be justified by experience with the particular machine or machine type. A set of suggested periodic test methods is presented in **4.1** and a list of suggested periodic tests during the working life of the MEDICAL ELECTRON ACCELERATOR and suggested intervals between such tests is presented in **4.2**. The manufacturer may recommend different intervals or additional or different tests, depending on the special requirements of the MEDICAL ELECTRON ACCELERATOR in question.

¹⁾ The second edition has been published in 1988.

Section 2. General, type tests

2.1 Format of Appendix B of the disclosure standard with suggested functional performance values

Introduction

The purpose of 2.1 is to provide a suggested format for the presentation of functional performance values corresponding to the standardized statements of functional performance in the disclosure standard, IEC Publication 976. USERS of MEDICAL ELECTRON ACCELERATORS may find this format useful in getting information from the manufacturer on the expected performance, in recording acceptance test values measured at the time of installation and in periodic testing of performance during the working life of the machine. Manufacturers may find it useful in declaring the functional performance values for their particular types of MEDICAL ELECTRON ACCELERATORS in response to IEC Publication 976. Although the manufacturer may use his own set of type test methods in developing functional performance data, he should make sure that the functional performance values which he declares would be met if the test methods of IEC Publication 976 were used. It is not suggested that a manufacturer should provide information to USERS from his type test in any greater detail than a simple declaration of these functional performance values.

As a result of extensive deliberations by Working Group 1 of IEC Sub-Committee 62C, a set of suggested values of functional performance was agreed upon with respect to the standardized statements of IEC Publication 976. These suggested values are shown in parentheses for each relevant clause. For Clauses 6 and 7, the suggested tolerance values are given only for NOMINAL ENERGIES in the range from 3 MeV to 50 MeV, since this range covers most of the practice with MEDICAL ELECTRON ACCELERATORS.

Tolerances are designated $\pm$ where they represent permissible deviations in more than one direction from a desired point or value. The $\pm$ designation is not used where the tolerance represents permissible deviation in any one direction between two points or values. The abbreviations “maxi”²⁾ and “mini” are used for “maximum” and “minimum”, respectively.

In addition to declaring functional performance values, for which this format is suitable, IEC Publication 976 also calls for the following other items to be provided in the ACCOMPANYING DOCUMENTS:

Clause	Item
3.6	Influencing quantities
6.1.3.1	Isodose charts for X-RADIATION, information to the USER
6.2.4.1	Isodose charts for ELECTRON RADIATION, information to the USER
7.1.5.1	X-RAY FIELDS with WEDGE FILTER, information to the USER

IEC Publication 601-2-1 also calls for certain information to be provided in the ACCOMPANYING DOCUMENTS.

²⁾ See national foreword for details of textual error.

FORMAT FOR PRESENTATION OF FUNCTIONAL PERFORMANCES VALUES

Manufacturer _____

MEDICAL ELECTRON ACCELERATOR Type Designation _____

Date _____ Location _____

Clause Abbreviation of Statement in Disclosure Standard

3.1 *Available NOMINAL ENERGIES and ABSORBED DOSE RATES*

X-RADIATION mode:

NOMINAL ENERGY	MeV	_____	_____	_____	_____	_____	_____	Gy/min, 10 cm × 10 cm RADIATION FIELD
NOMINAL ENERGY	MeV	_____	_____	_____	_____	_____	_____	Gy/min, 10 cm × 10 cm RADIATION FIELD
NOMINAL ENERGY	MeV	_____	_____	_____	_____	_____	_____	Gy/min, 10 cm × 10 cm RADIATION FIELD
NOMINAL ENERGY	MeV	_____	_____	_____	_____	_____	_____	Gy/min, maximum RADIATION FIELD
NOMINAL ENERGY	MeV	_____	_____	_____	_____	_____	_____	Gy/min, maximum RADIATION FIELD
NOMINAL ENERGY	MeV	_____	_____	_____	_____	_____	_____	Gy/min, maximum RADIATION FIELD

ELECTRON RADIATION mode:

NOMINAL ENERGY	MeV	_____	_____	_____	_____	_____	_____	Gy/min ^a
NOMINAL ENERGY	MeV	_____	_____	_____	_____	_____	_____	Gy/min ^a
NOMINAL ENERGY	MeV	_____	_____	_____	_____	_____	_____	Gy/min ^a
NOMINAL ENERGY	MeV	_____	_____	_____	_____	_____	_____	Gy/min ^a
NOMINAL ENERGY	MeV	_____	_____	_____	_____	_____	_____	Gy/min ^a
NOMINAL ENERGY	MeV	_____	_____	_____	_____	_____	_____	Gy/min ^a
NOMINAL ENERGY	MeV	_____	_____	_____	_____	_____	_____	Gy/min ^a

^a The same ABSORBED DOSE RATE applies for both 10 cm × 10 cm and maximum RADIATION FIELD in ELECTRON RADIATION mode.

Values
declared (suggested)

Clause Abbreviation of Statement in Disclosure Standard

3.2 Available RADIATION FIELDS (at NORMAL TREATMENT DISTANCE)

X-RADIATION mode:

Minimum square	_____ cm × _____ cm	
Maximum square	_____ cm × _____ cm	(Fully flattened RADIATION FIELD, square corners)
Maximum with clipped corners	_____ cm × _____ cm	Diagonals _____ cm × _____ cm

ELECTRON RADIATION mode:

Minimum square	_____ cm × _____ cm	
Maximum square	_____ cm × _____ cm	
Other rectangular	_____ cm × _____ cm,	_____ cm × _____ cm, _____ cm × _____ cm,
	_____ cm × _____ cm,	_____ cm × _____ cm, _____ cm × _____ cm,
	_____ cm × _____ cm	

Adjustable RADIATION FIELD range _____ cm × _____ cm to _____ cm × _____ cm

A₁ Unless otherwise stated, all functional performance values, related to the selection of specific RADIATION FIELD sizes, are to be the result of selection of RADIATION FIELD size by the adjustable BLD system (jaws). Unless otherwise stated, all RADIATION FIELDS are symmetrically placed about the REFERENCE AXIS.

For a multi-element BLD, the following information shall be provided.

X-RADIATION mode:

Adjustable RADIATION FIELD range:

square corners	from: _____ cm × _____ cm to: _____ cm × _____ cm
maximum with clipped corners	_____ cm × _____ cm diagonals: _____ cm × _____ cm

Maximum offset of centre of RADIATION FIELD in relation to the REFERENCE AXIS:

ELECTRON RADIATION mode (if applicable): _____ mm

Adjustable RADIATION FIELD range:

square corners	from: _____ cm × _____ cm to: _____ cm × _____ cm
maximum with clipped corners	_____ cm × _____ cm diagonals: _____ cm × _____ cm

Minimum offset of centre of RADIATION FIELD in relation to the REFERENCE AXIS: _____ mm **A₁**

NORMAL TREATMENT DISTANCE

X-RADIATION mode:	_____ cm
ELECTRON RADIATION mode:	_____ cm

Clause	Abbreviation of Statement in Disclosure Standard		Values	
			declared	(suggested)
3.4	Available FILTERS			
X-RAY FIELD FLATTENING FILTERS:				
Designation	NOMINAL ENERGY	Maximum square RADIATION FIELD (square corners)		
_____	_____ MeV	_____ cm × _____ cm		
_____	_____ MeV	_____ cm × _____ cm		
_____	_____ MeV	_____ cm × _____ cm		
ELECTRON FIELD-FLATTENING FILTERS:				
Designation	NOMINAL ENERGY range	Maximum square RADIATION FIELD		
_____	_____ MeV to _____ MeV	_____ cm × _____ cm		
_____	_____ MeV to _____ MeV	_____ cm × _____ cm		
_____	_____ MeV to _____ MeV	_____ cm × _____ cm		
_____	_____ MeV to _____ MeV	_____ cm × _____ cm		
X-RAY WEDGE FILTERS:				
Designation	NOMINAL ENERGY	Maximum RADIATION FIELD	WEDGE FILTER ANGLE	Related isodose value
_____	_____ MeV	_____ cm × _____ cm	_____ °	_____ %
_____	_____ MeV	_____ cm × _____ cm	_____ °	_____ %
_____	_____ MeV	_____ cm × _____ cm	_____ °	_____ %
_____	_____ MeV	_____ cm × _____ cm	_____ °	_____ %
_____	_____ MeV	_____ cm × _____ cm	_____ °	_____ %
_____	_____ MeV	_____ cm × _____ cm	_____ °	_____ %
_____	_____ MeV to _____ MeV	_____ cm × _____ cm	_____ °	_____ %
_____	_____ MeV to _____ MeV	_____ cm × _____ cm	_____ °	_____ %

Values
declared (suggested)

Abbreviation of Statement in Disclosure Standard					
: X-RAY WEDGE FILTERS					
Designation	NOMINAL ENERGY	Maximum RADIATION FIELD	WEDGE FILTER ANGLE	Related isodose value	WEDGE FILTER FACTOR
:					
_____	_____ MeV	_____ cm × _____ cm	_____ °	_____ %	_____ %
_____	_____ MeV	_____ cm × _____ cm	_____ °	_____ %	_____ %
_____	_____ MeV	_____ cm × _____ cm	_____ °	_____ %	_____ %
_____	_____ MeV	_____ cm × _____ cm	_____ °	_____ %	_____ %
_____	_____ MeV	_____ cm × _____ cm	_____ °	_____ %	_____ %
_____	_____ MeV	_____ cm × _____ cm	_____ °	_____ %	_____ %

Clause
3.5 Availability
Time necessary to reach the READY STATE from the STAND-BY STATE...

_____ min

3.6 Influencing quantities

Environmental conditions:
Ambient temperature
Relative humidity
Atmospheric pressure
Maximum period of continuous operation:
(possibly influencing the functional performance characteristics)

_____ °C to _____ °C
_____ % to _____ %
_____ Pa to _____ Pa

5 DOSE MONITORING SYSTEM

Range of ABSORBED DOSE over which the standard is met...
Range of ABSORBED DOSE RATES over which the standard is met...

_____ % to _____
_____ % to _____

5.1 Reproducibility

Maximum coefficients of variation of ratio R of
a) the number of DOSE MONITOR UNITS and ABSORBED DOSE for X-RADIATION
b) the number of DOSE MONITOR UNITS and ABSORBED DOSE for ELECTRON RADIATION
The average of a number of determinations of R is defined as $\bar{R}$ in the following.

_____ %

Values
declared (suggested)

Abbreviation of Statement in Disclosure Standard

Clause
5.2

Proportionality

Maximum deviation of the measured ABSORBED DOSE from the value given by multiplying the measured value U of DOSE MONITOR UNITS by the proportionality factor S over the following ranges of ABSORBED DOSE and ABSORBED DOSE RATES:

X-RADIATION NOMINAL ENERGY _____ MeV

of _____ Gy to _____ Gy at _____ Gy/min to _____ Gy/min...

Declared deviation $\pm$ _____ $\pm$ _____ $\pm$ _____ % (2)

ELECTRON RADIATION NOMINAL ENERGY _____ MeV

of _____ Gy to _____ Gy at _____ Gy/min to _____ Gy/min...

Declared deviation $\pm$ _____ $\pm$ _____ $\pm$ _____ $\pm$ _____ $\pm$ _____ $\pm$ _____ % (2)

5.3 Dependence on angular positions

Maximum difference between the maximum and minimum values of $\bar{R}$ over the full angular ranges of the GANTRY and BEAM LIMITING SYSTEM...

X-RADIATION
Declared maximum difference... _____ % (3)

ELECTRON RADIATION
Declared maximum difference... _____ % (3)

5.4 Dependence on GANTRY rotation

As the GANTRY moves, the maximum deviation of $\bar{R}$ from the arithmetic mean of the maximum and minimum values of $\bar{R}$ determined in Sub-clause 5.3

X-RADIATION
Declared maximum deviation... _____ % (2)

ELECTRON RADIATION
Declared maximum deviation... _____ % (2)

Clause	Abbreviation of Statement in Disclosure Standard	declared	Values (suggested)
5.5	<i>Dependence on the shape of the RADIATION FIELD</i>		
	Maximum difference of $\bar{R}$ between 5 cm × 20 cm and 20 cm × 5 cm fields (or maximum if less than 20 cm)...		
	X-RADIATION		
	Declared maximum difference... _____ %		
	ELECTRON RADIATION		
	Declared maximum difference... _____ %		
5.6	<i>Stability of calibration</i>		
5.6.1	<i>Stability after high ABSORBED DOSE delivered</i>		
	X-RADIATION		
	Maximum difference of $\bar{R}$ between beginning and end of...		
	a) IRRADIATION of 100 Gy at NORMAL TREATMENT DISTANCE...	_____ %	(2)
	b) or a period of 30 minutes at maximum nominal ABSORBED DOSE RATE, whichever results in the shorter period...	_____ %	(2)
	ELECTRON RADIATION		
	Maximum difference of $\bar{R}$ between beginning and end of...		
	a) IRRADIATION of 100 Gy at NORMAL TREATMENT DISTANCE...	_____ %	(2)
	b) or a period of 30 minutes at maximum nominal ABSORBED DOSE RATE, whichever results in the shorter period...	_____ %	(2)
5.6.2	<i>Stability throughout the day</i>		
	Maximum difference of $\bar{R}$ between beginning and end of 8 hours of successive 4 Gy IRRADIATIONS followed by 10 minutes without IRRADIATION...		
	X-RADIATION	_____ %	(2)
	ELECTRON RADIATION	_____ %	(2)

Clause	Abbreviation of Statement in Disclosure Standard	Values declared (suggested)	
5.6.3	<i>Stability throughout the week</i> Maximum difference between the highest and lowest values of $\bar{R}$ measured immediately following switch-on on 5 consecutive days... X-RADIATION ELECTRON RADIATION	____ % ____ %	(2) (2)
5.7	<i>Stability in MOVING BEAM RADIOTHERAPY</i> X-RADIATION Where GANTRY angular range TERMINATES IRRADIATION the maximum difference between the reading of DOSE MONITOR UNITS and the value calculated by multiplying preset DOSE MONITOR UNITS per unit angle by preset angular range of GANTRY rotation... Where the DOSE MONITOR SYSTEM TERMINATES IRRADIATION the maximum difference in degrees between the GANTRY rotation angular range traversed and the angular range calculated by dividing preset DOSE MONITOR UNITS by the value of preset DOSE MONITOR UNITS per unit angle... ELECTRON RADIATION Where GANTRY angular range TERMINATES IRRADIATION the maximum difference between the reading of DOSE MONITOR UNITS and the value calculated by multiplying preset DOSE MONITOR UNITS per unit angle by preset angular range of GANTRY rotation... Where the DOSE MONITOR SYSTEM TERMINATES IRRADIATION, the maximum difference in degrees between the GANTRY rotation angular range traversed and the angular range calculated by dividing preset DOSE MONITOR UNITS by the value of preset DOSE MONITOR UNITS per unit angle...	____ % ____ ° ____ % ____ °	(5) (3) (5) (3)
6	Depth ABSORBED DOSE characteristics		
6.1	<i>X-RADIATION</i> NOMINAL X-RAY ENERGY (of electrons striking the X-ray TARGET)... DEPTH OF DOSE MAXIMUM for 10 cm × 10 cm RADIATION FIELD... DEPTH OF DOSE MAXIMUM for maximum RADIATION FIELD... PENETRATIVE QUALITY (10 cm × 10 cm RADIATION FIELD) Maximum deviation of actual value from declared value of PENETRATIVE QUALITY... QUALITY INDEX	____ ____ ____ ____ ____ ____ ____	MeV cm cm cm % (3) mm (3)

Clause	Abbreviation of Statement in Disclosure Standard	Values	
		declared	(suggested)
	RELATIVE SURFACE DOSE for 10 cm × 10 cm RADIATION FIELD...	_____ %	
	RELATIVE SURFACE DOSE for maximum RADIATION FIELD...	_____ %	
6.2	<i>ELECTRON RADIATION</i>		
6.2.1 and 6.2.3	<i>Depth dose charts</i>		
	<i>SURFACE DOSE</i>		
	NOMINAL ENERGY of electrons	_____ MeV	
	DEPTH OF DOSE MAXIMUM (10 cm × 10 cm RADIATION FIELD), minimum	_____ cm	(0,1)
	DEPTH OF DOSE MAXIMUM (maximum RADIATION FIELD), minimum	_____ cm	(0,1)
	Ratio of PRACTICAL RANGE to depth of 80 % ABSORBED DOSE (for 10 cm × 10 cm RADIATION FIELD)	_____	
	Ratio of PRACTICAL RANGE to depth of 80 % ABSORBED DOSE (for maximum RADIATION FIELD), maximum	_____	(1,6)
	PRACTICAL RANGE... (10 cm × 10 cm RADIATION FIELD)	_____ cm	
	PENETRATIVE QUALITY... (10 cm × 10 cm RADIATION FIELD)	_____ cm	
	Maximum deviation of actual value from declared value of PENETRATIVE QUALITY	_____ % _____ mm	(3) (2)
	RELATIVE SURFACE DOSE (10 cm × 10 cm RADIATION FIELD), maximum	_____ %	(100)
	RELATIVE SURFACE DOSE (maximum RADIATION FIELD), maximum	_____ %	(100)
6.2.2	<i>Stability of PENETRATIVE QUALITY</i>		
	Maximum variation of PENETRATIVE QUALITY of ELECTRON RADIATION with angular position of the GANTRY and usable range of nominal ABSORBED DOSE RATES...	_____ mm _____ %	(2) (1)
	Uniformity of RADIATION FIELDS (see Figure 4 for flattened area)		
6.2.1	<i>X-RADIATION</i>		

Clause	Abbreviation of Statement in Disclosure Standard	Values	
		declared	(suggested)
7.1.1	<i>Flatness of square X-RAY FIELDS</i>		
	NOMINAL ENERGY	_____ MeV	
	Maximum ratio of maximum ABSORBED DOSE anywhere in the RADIATION FIELD to minimum ABSORBED DOSE in flattened area of RADIATION FIELD both at STANDARD MEASUREMENT DEPTH...		
	5 cm × 5 cm to 30 cm × 30 cm...	_____ %	(106)
	greater than 30 cm × 30 cm to maximum square...	_____ %	(110)
7.1.2	<i>Deviation of dose distribution of square X-RAY FIELDS with angular positions</i>		
	Maximum variation in the ratio of ABSORBED DOSE at a point in the flattened area to ABSORBED DOSE on the RADIATION BEAM AXIS both at STANDARD MEASUREMENT DEPTH for all angular positions of the GANTRY and BEAM LIMITING SYSTEM...		
	NOMINAL ENERGY less than 30 MeV...	_____ %	(3)
	NOMINAL ENERGY 30 MeV and above...	_____ %	(4)
7.1.3	<i>Symmetry of square X-RAY FIELDS</i>		
	Maximum ratio of ABSORBED DOSES at points symmetrically displaced from the AXIS OF THE BEAM and within the flattened area at STANDARD MEASUREMENT DEPTH...	_____ %	(103)
7.1.4	<i>Maximum ratio of ABSORBED DOSE</i>		
	NOMINAL ENERGY	_____ MeV	
	Maximum ratio of ABSORBED DOSE in the RADIATION FIELD to ABSORBED DOSE on the RADIATION BEAM AXIS in the plane at the DEPTH OF DOSE MAXIMUM...		
	5 cm × 5 cm to 30 cm × 30 cm...	_____ %	(107)
	greater than 30 cm × 30 cm to maximum square...	_____ %	(109)
7.1.5	<i>X-RAY FIELDS WITH WEDGE FILTERS (see Sub-clause 3.4)</i>		
	NOMINAL ENERGY	_____ MeV	
	Maximum deviation of WEDGE FILTER FACTOR...	_____ %	(2)
	Maximum deviation of WEDGE FILTER ANGLE...	_____ deg	(2)

Clause	Abbreviation of Statement in Disclosure Standard	Values declared	Clause (suggested)
7.2	<i>ELECTRON RADIATION</i>		
7.2.1	<i>Flatness of ELECTRON FIELDS</i>		
	Maximum distance between 80 % isodose contours and edge of GEOMETRICAL FIELD projection at base depth... along major axes...	_____ mm	(15)
	Maximum distance between 90 % isodose contours and edge of GEOMETRICAL FIELD projection at STANDARD MEASUREMENT DEPTH... along major axes...	_____ mm	(10)
	along bisectors of corners...	_____ mm	(20)
	Ratio of the highest ABSORBED DOSE anywhere in the RADIATION FIELD at STANDARD MEASUREMENT DEPTH to the ABSORBED DOSE on the RADIATION BEAM AXIS at the DEPTH OF DOSE MAXIMUM...	_____ %	
7.2.2	<i>Deviation of dose distribution of ELECTRON FIELDS with angular positions</i>		
	Maximum variation in the ratio of ABSORBED DOSE at any point in the flattened area confined by the line 1 cm inside the 90 % isodose contour at STANDARD MEASUREMENT DEPTH to the ABSORBED DOSE on the RADIATION BEAM AXIS at the same depth for all angular positions of the GANTRY and BEAM LIMITING SYSTEM...	_____ %	(3)
7.2.3	<i>Symmetry of ELECTRON FIELDS</i>		
	Maximum ratio of ABSORBED DOSES at points symmetrically displaced from the RADIATION BEAM AXIS and more than 1 cm inside the 90 % isodose contour at STANDARD MEASUREMENT DEPTH...	_____ %	(105)
7.2.4	<i>Maximum ratio of ABSORBED DOSE</i>		
	Maximum ratio of ABSORBED DOSE in the RADIATION FIELD at 0,5 mm depth to ABSORBED DOSE on the RADIATION BEAM AXIS at DEPTH OF DOSE MAXIMUM...	_____ %	