

Translated English of Chinese Standard: YY0775-2010

www.ChineseStandard.net

Sales@ChineseStandard.net

YY

PHARMACEUTICAL INDUSTRY STANDARD
OF THE PEOPLE'S REPUBLIC OF CHINA

ICS 11.040.60

C 43

YY 0775-2010

**Teleradiotherapy treatment planning system accuracy
of dosimetric calculation and test methods for high
energy X (γ) beam**

远距离放射治疗计划系统

高能 X (γ) 射束剂量计算准确性

要求和试验方法

YY 0775-2010 How to BUY & immediately GET a full-copy of this standard?

1. www.ChineseStandard.net;
2. Search --> Add to Cart --> Checkout (3-steps);
3. No action is required - Full-copy of this standard will be automatically & immediately delivered to your EMAIL address in 0~25 minutes.
4. Support: Sales@ChineseStandard.net. Wayne, Sales manager

Issued on: December 27, 2010

Implemented on: June 1, 2012

Issued by: China Food and Drug Administration

Table of Contents

Foreword.....	3
1 Scope	4
2 Normative references	4
3 Terms and definitions	4
4 Requirements	5
4.1 Simple geometric conditions.....	5
4.2 Complex geometric conditions.....	5
4.3 Combination of complex geometric conditions	5
4.4 The outer edge of radiation field	6
4.5 The outer edge of radiation field, complex geometric conditions and the central axis is blocked	6
5 Test methods	6
5.1 General test conditions	6
5.2 Test example.....	9
5.3 Simple geometric conditions.....	9
5.4 Complex geometric conditions.....	9
5.5 Combination of complex geometric conditions	10
5.6 The outer edge of radiation field	10
5.7 The outer edge of radiation field, complex geometric conditions and the central axis is blocked	10
Appendix A.....	11
Appendix B	12
References	23

Foreword

All technical content of this Standard is mandatory.

This Standard was drafted in accordance with the rules given in GB/T 1.1-2009.

The test data and examples in this Standard adopt the test data (machine configuration data) and examples in IAEA No.1540 Technical Report.

Please note that some of the content of this document may involve patents; the issuing agency of this document does not undertake the responsibility for the identification of these patents.

This Standard was proposed by and shall be under the jurisdiction of Subcommittee on Radiotherapy, Nuclear medicine and Radiation Dosimetry Equipment of National Technical Committee on Medical Electrical Equipment of Standardization Administration of China (SAC/TC 10/SC 3).

Drafting organizations of this Standard: Beijing Institute for Medical Device Quality Supervision and Testing of State Food and Drug Administration.

Main drafters of this Standard: Zhang Xin, Zhang Zhaoyuan, Yan Xu, Hu Jia and Qing Hou.

Teleradiotherapy treatment planning system accuracy of dosimetric calculation and test methods for high energy X (γ) beam

1 Scope

This Standard specifies the accuracy of dosimetric calculation and test methods of Radiotherapy Treatment Planning Systems (hereinafter referred to as RTPS).

This Standard applies to RTPS with dosimetric calculation and display function of high energy X rays (4 MV ~ 25 MV), ^{60}Co γ rays remote radiotherapy treatment on photon radiation.

This Standard does not apply to the radiation treatment planning systems that are used by stereotactic radiotherapy, intensity modulated radiation therapy (IMRT) or other specialized radiotherapy techniques. However, the developers are encouraged to use this Standard in development, and use as reference standard in verifying dosimetric calculation algorithm.

Test packets in this Standard cannot be used for clinical treatment planning.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 17857-1999 *Medical radiology - Terminology (Equipment for radiotherapy, nuclear medicine and radiation dosimetry)*

GB/T 18987-2003 *Radiotherapy equipment - Coordinates, movements and scales*

3 Terms and definitions

The terms and definitions defined by GB/T 17857-1999 and the following ones apply to this document.

The test requires to calculate point dose of a series of positions in a cube water body model. Users are recommended to specify a cube water body model of which the side length is 40 cm for RTPS, before test. Most RTSP allows to determine the dose measurement points by inputting coordinate values. However, if RTPS do not have the aforementioned functions, an easy way is to use beam's central axis, off-axis distance (1cm, 2cm, 2.5cm, 3cm, 5cm, 6cm, 7cm, 9cm and 19cm) and calculation depth (d_{max} , 1cm, 3cm, 5cm, 10cm, 11cm, 15cm, 20cm, 25cm, 30cm and 35cm) to represent for each measurement point. Each test example has specified the aforementioned off-axis distance and depth.

For each test example, the operator shall place radiation beam at the position stipulated in the test example; and mark the calculation point of depth and off-axis distance required by test. It shall use a great enough radiation beam weighting to ensure that calculation result has enough accuracy, i.e., not using too small weighting may be because of that the rounding or data truncation causes the accuracy of calculation result less than 1%.

5.1.3 Beam dose setting

In some RPTS, beam dose setting is corresponding to the dose when beam is transferred to d_{max} . While in some other systems, beam dose setting is corresponding to the dose when beam is transferred to reference radiation field size (i.e., 10 cm × 10 cm). Some other systems use different setting ways to set beam dose. Users shall be familiar with beam dose setting ways and ensure that calculation result is consistent to the conditions of obtaining corresponding test data.

5.1.4 Coordinate system

In order to more-clearly express the geometric relationship between beam data and test examples, the following coordinate system is stipulated related to water body model. Water body model's coordinate system is consistent to the fixed coordinate system stipulated in GB/T 18987-2003:

Coordinate origin is at the isocenter of therapy equipment. Except isocenter test example (test example 3); isocenter of other test examples all locates at the surface of water body model.

Z-axis is perpendicular to the upper surface and points upward from the surface. Z-axis coincides with the central axis of the radiation beam and points to radiation source. Oblique incidence test example is excluded.

5.5 Combination of complex geometric conditions

Test shall conduct test example 12; calculate error according to formula (1).

Test results shall comply with requirements of 4.3.

5.6 The outer edge of radiation field

Test on measurement point of the outer edge of radiation field shall conduct test example 1, 2, 3, 6; calculate error according to formula (2):

$$\delta_2 = 100 \times (D_c - D_r) / D_a \quad \dots\dots\dots(2)$$

Where,

δ_2 - Normalized relative error of measurement point of the outer edge of radiation field, %;

D_c - Calculated values;

D_r - Reference values;

D_a - Reference values of same depth on radiation beam.

Test results shall comply with requirements of 4.4.

5.7 The outer edge of radiation field, complex geometric conditions and the central axis is blocked

Test on central beam measurement point of the outer edge of radiation field under complex geometric conditions and the central axis is blocked shall conduct test example 5, 7; calculate error according to formula (3):

$$\delta_3 = 100 \times (D_c - D_r) / D_o \quad \dots\dots\dots(3)$$

Where,

δ_3 - Normalized relative error of the outer edge of radiation field, complex geometric conditions and the central axis is blocked, %;

D_c - Calculated values;

D_r - Reference values;

D_o - Reference values of same depth in open field.

Test results shall comply with requirements of 4.5.

Appendix A

(Normative)

Test data

This Standard introduces data package in IAEA No.1540 Technical Report ^[1] as predefined test conditions and test data of this Standard. The data package is divided into four parts, respectively including input data and test results of 6 MV, 10 MV, 18 MV and ⁶⁰Co γ . When using data package, it shall select suitable data sets, input data by combining corresponding RTPS requirements, select appropriate radiation beam model, build up test's geometric conditions, calculate dose of measurement point and input calculated values into evaluation table for error calculation.

Test data package includes the following four parts:

- IAEApack06MV NCS data package for 6 MV X;
- IAEApack10MV NCS data package for 10 MV X;
- IAEApack18MV NCS data package for 18 MV X;
- IAEApackCo60 AKH data package for Co-60.

NOTE: After research and assessment by the parties who reach an agreement based on this Standard, if the aforementioned data package is inappropriate to use due to RTPS product diversification characteristics, it shall self-design the data package for the test of this project. Technical requirements of the data package shall be adaptable to IAEA No.1540 Technical Report ^[1].

Figure B.17 Test 11 and test 12

B.19 Test example 12 asymmetric semi-wedge field and a quarter wedge field

This test example uses a 15 cm × 15 cm radiation field with 60° wedge plate. Beam central axis is respectively placed at (0 cm, ±7.5 cm), (±7.5 cm, 0 cm) and (±7.5 cm, ±7.5 cm). The dose calculation points are at + 6.0 cm, 0.0 cm and - 6.0 cm from radiation field central axis.

References

- [1] International Atomic Energy Agency, *Specification and Acceptance Testing of Radiotherapy Treatment Planning Systems*, IAEA, VIENNA, (2007)

_____ END _____