

ICS 13.280
CCS C 57

WS

**INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

WS 667-2019

**Specification for testing of quality control in robotic arm
radiotherapy device
(English Translation)**

Issued on: September 27, 2019

Implemented on: April 1, 2020

Issued by: National Health Commission

Table of Contents

Foreword
1 Scope
2 Terms and definitions
3 General requirements
4 Dose interlocking and indication performance test methods
5 Detection methods
Appendix A (Normative Appendix) Testing Items, Testing Conditions and Requirements
Appendix B (informative) Test reference phantom selected
Appendix C (informative) Calculation formula for laterally charged particle equilibrium distance
References

Foreword

Chapter 3 and Appendix A of this standard are mandatory, and the rest are recommended.

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

This standard was drafted. Institute of Radiation Medicine, Shandong Academy of Medical Sciences, Peking University Cancer Hospital, Beijing Center for Disease Control and Prevention heart.

1 Scope

This standard specifies the quality control and protective performance testing items, testing methods and requirements of robotic arm radiation therapy devices.

This standard applies to quality control and protective performance testing of robotic arm radiation therapy devices.

2 Terms and definitions

The following terms and definitions apply to this document.

Robotic arm radiotherapy device A radiotherapy device for concentrating multiple high-energy X-ray beams to a target area by a robotic arm for treating lesions in various parts of the human body.

Note: The device contains three main components. a linear accelerator, a robotic arm, and an X-ray

imaging system.

End-to-End (E2E) test by using the phantom to simulate the clinical radiotherapy process, from scanning the phantom to formulating the radiotherapy plan (starting end) to completing the irradiation (ending end), A quality control test for the positioning and tracking accuracy of a robotic arm radiation therapy device.

Note: The purpose is to determine the overall position deviation of each tracking mode of the robotic radiation therapy device.

Ball cube

One of the quality control testing phantoms of a robotic arm radiation therapy device, used to measure positioning and tracking accuracy. Is a square phantom containing A film of acrylic spheres was placed, which in the measurement represented the illuminated target area.

Dose output stability the dose output by the robotic radiotherapy device maintains stable performance relative to the baseline value in the initial state.

Tracking method

Robotic arm radiation therapy device automatically corrects real-time images of exposure acquisition of the X-ray imaging system by moving the position of the robotic arm or treatment table Image and treatment planning method of computer tomography (CT) scan-generated digitally reconstructed image (DRR) deviation in the six-dimensional direction of space.

Note: Tracking methods generally include six-dimensional skull tracking methods, gold label tracking methods, spine tracking methods, synchronized breathing tracking methods, and lung tracking methods.

3 General requirements

3.1

The quality control and protective performance testing items, testing conditions and requirements of the robotic arm radiation therapy device are shown in Appendix A.

3.2

After new installation or overhaul of the robotic arm radiation therapy device, acceptance inspection should be carried out, and condition inspection and stability inspection should be performed regularly during use.

Measurement. The testing items of acceptance testing and status testing shall cover the items specified in this standard.

The corresponding test items of the tested equipment shall be explained in the test report.

3.3

The contents of the report of the acceptance test and status test shall include at least. the basic information of the inspected unit, the basic information of the inspected equipment, the test items, Test conditions, test results and test conclusions.

3.4

The results of the acceptance test and status test are qualified when they meet or exceed the corresponding requirements in Appendix A.

3.5

The stability testing items shall include at least the items specified in Appendix A, and the frequency of testing shall not be less than the period specified in Appendix A. Make the unit shall record and archive the corresponding information such as the date of the stability test, the test personnel, and the test results.

4.1 Number and function of dose monitoring systems

4.1.1

Place the robotic arm radiation therapy device during the irradiation process, observe whether the console interface has a dual-channel dose monitoring system and display positive often.

4.1.2

Test the two dose monitoring systems separately. After one dose monitoring system is artificially closed, observe whether the other one works normally the output dose is displayed and the irradiation can be stopped immediately.

4.2 Low dose rate interlocking

4.2.1

In physical mode, preset the robot arm radiation therapy device to output 1000 MU.

4.2.2

Observe whether the dose can be terminated immediately when the dose rate is artificially lower than 85% of the normal dose rate.

4.3 Treatment bed collision indication

4.3.1

Use a phantom to create a treatment plan for the head or body; in demo mode, this plan is allowed to be executed.

4.3.2

Close the door-machine interlock to enter the treatment room; use the hand control box to raise the treatment bed or move it to the left and right for a certain distance (for example 15 cm).

4.3.3

In demo mode, execute the created treatment plan; observe if the execution can be terminated at a location that may cause a collision. Make a treatment plan and give a collision warning message.

4.4 Fixed collimator picking error indication

4.4.1

In the treatment room, manually change the placement of any fixed collimator.

4.4.2

On the console, drive the robotic arm to pick up the collimator whose placement has been changed, and observe if a fixed collimator pick-up appears on the console. Get the error message.

4.5 Console display, password protection and interlock

4.5.1

Observe whether the console interface can display the irradiation dose and irradiation time parameters.

4.5.2

Using the phantom, create a treatment plan for the head or body, and observe whether the treatment plan output is password protected.

4.5.3

In the physical mode, the artificial default console irradiation parameter pre-selected value, observe whether the irradiation can be started; when the key switch is not turned on, observe whether the irradiation can be started.

5.1 Dose output stability deviation

5.1.1

Place the equivalent plate phantom or other equivalent phantom of the robotic arm radiation therapy device on the treatment table, and use the front pointer to determine the phantom and then insert it into the ionization chamber.