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**Specification for testing of quality control in X-ray computed
tomography
(English Translation)**

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Foreword

Chapter 4 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 is revised on the basis of GB 17589-2011 "X-ray computed tomography device quality assurance testing specification", and Compared with GB 17589-2011, the main technical changes are as follows.

- modified the standard name;
- increased the number of items;
- Revised the scope of application of the standard;
- modified some terms and definitions;
- Added a chapter on "Quality Control Testing Requirements";
- Added a description of the method for detecting the tilt accuracy of the gantry using the slope indicator method;

- Revised the criteria for determining the thickness deviation of the reconstructed layer;
- Revised the judgment criteria for CTDI_w acceptance detection and status detection;
- Removed the status detection and stability detection requirements of the CTDI_w body phantom;
- Modified noise detection methods and requirements;
- Modified the stability detection period of noise;
- Removed the stability detection requirements for high contrast resolution;
- Removed the state detection requirements for high contrast algorithms in high contrast resolution;
- Modified the detection method and correction formula for low contrast detectability;
- Modified the detection method of CT value linearity and deleted the requirement of state detection for linearity of CT value;
- Further stipulates the diameter requirements of the water mold.

This standard was drafted. China Center for Disease Control and Prevention, Institute of Radiation Protection and Nuclear Safety, Beijing Municipal Center for Disease Control and Prevention, the first Beijing Tongren Hospital affiliated to the University of Medical Sciences.

1 Scope

This standard specifies the requirements and methods for quality control testing of X-ray computed tomography (CT).

This standard applies to quality control testing of diagnostic CT, including acceptance testing, CT status detection and stability testing. radiation in the treatment of simulated positioning CT, CT for nuclear medicine can be implemented with reference to this standard.

This standard does not apply to cone beam CT (CBCT), such as dental CT, breast CT, etc.; also does not apply to mobile CT dedicated to head examination.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated version applies to this document.

For undated references, the latest edition (including all amendments) applies to this document.

GB/T 19042.5 Evaluation and routine testing of medical imaging systems - Part 3-5. Imaging performance of X-ray computed tomography equipment Acceptance test

3 Terms and definitions

The following terms and definitions apply to this document.

X-ray computed tomography; CT the subject is located between the X-ray tube and the detector, performs multi-directional X-ray scanning, and passes the detected signal through computer processing.

A digital radiological diagnostic device for reconstructing tomographic images.

CT dose index 100 CT dose index 100; CTDI₁₀₀ the integral of the dose profile curve from -50 mm to 50 mm along the central axis of the standard cross section, divided by the nominal layer, in a single axial scan the product of the thickness and the number of layers N is calculated according to equation (1).

CTDI D z dz

In the formula.

N - the number of layers produced by a single axial scan;

T -- nominal layer thickness;

() D z -- dose profile distribution along the central axis of the standard cross section.

Note: This formula applies when the NT. is not more than 40 mm.

Weighted CT dose index weighted CT dose index; CTDI_w the value of the weighted summation of the CTDI 100 measured at the center point of the phantom and the average value of the CTDI 100 measured at the peripheral points is calculated according to the formula (2).

100, 100,

Wc pCTDI CTDI CTDI= ...(2) in the formula.

100, CCTDI - CTDI₁₀₀ for the center point measurement of the phantom;

100, pCTDI - The average of CTDI₁₀₀ measured at various points around the phantom.

CT value CT number

The amount used to represent the average of the X-ray attenuation associated with the region corresponding to each pixel of the X-ray CT image. Usually in Hounsfield units Representation, referred to as HU. The expression of the CT value is shown in equation (3).

1000CT

= x material water substance ...(3) in the formula.

?? Substance--the linear attenuation coefficient of the material in the region of interest;

Water - the linear attenuation coefficient of water.

The CT value is defined according to the above scale, the CT value of water is 0 HU, and the CT value of air is -1 000 HU.

Region of interest; ROI the area of interest (such as a circle or rectangle) defined in the image.

Average CT value mean CT number the average of the CT values of all pixels in a particular region of interest in a CT image.

CT noise CT noise

Refers to the variation of the CT value of a given area in a uniform material image. The value can be used as the standard for the CT value of the homogeneous substance in the region of interest.

The difference is divided by the contrast scale.

Uniformity

Consistent CT image values of uniform material images throughout the scanning field.

Dose profile distribution profile in the CT patient dose description, the dose distribution curve along a straight line is taken as a function of position.

3.10

Sensitivity profile

A profile of the relative response values of the CT as a function of position along a line perpendicular to the plane of the body layer.

3.11

Full width at half-maximum; FWHM in the CT scan, the sensitivity profile distribution curve and the dose profile distribution curve have a height on the ordinate that is half of the maximum value.

The distance traveled on the abscissa.

3.12

Nominal tomography

The layer thickness selected and indicated on the CT control panel.

3.13

Reconstructed slice thickness the full width at half maximum of the imaging sensitivity profile distribution curve at the center of the scan.

3.14