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

YY/T 1766.3-2023

**Image quality evaluation methods for X-ray computed
tomography equipment - Part 3: Performance evaluation of
dual-energy imaging and spectral applications**

X射线计算机体层摄影设备图像质量评价方法 第3部分：双能量成像与能谱应用性能评价

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1. Structure and Drafting Rules of Standardization Documents" Drafting. This document is Part 3 of YY/T 1766 "Method for Image Quality Evaluation of X-ray Computed Tomography Equipment". YY/T 1766 The following sections have been published.

1. Modulation transfer function evaluation;

2. Low-contrast resolution evaluation. Please note that some content in this document may be subject to patents. The publisher of this document assumes no responsibility for identifying patents. This part is proposed by the State Drug Administration. This part is sponsored by the Medical X-ray Equipment and Appliances Sub-Technical Committee of the National Medical Electrical Standardization Technical Committee (SAC/TC10/SC 1) Report. This section was drafted by: Shanghai Siemens Medical Devices Co., Ltd.,

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Image quality evaluation is an important task in the standardization work related to X-ray computed tomography equipment (CT scanning device). especially in Today, with the increasing development of CT technology, the evaluation method of CT scanning device imaging has changed from subjective judgment based on in-plane structured imaging. It has entered a new stage of combining subjective and objective imaging and introducing quantitative evaluation for isotropic imaging that contains structural and functional information. YY/T 1766 is a method standard system for image quality evaluation of CT scanning devices, aiming to establish standards for related image performance and imaging methods. Standardized evaluation method, the standards currently published and under development consist of the following three parts.

- 1.Modulation transfer function evaluation. The purpose is to establish an evaluation method for the spatial imaging resolution of CT scanning devices.
- 2.Low-contrast resolution evaluation. The purpose is to establish an absolute evaluation method for low contrast imaging in CT scanning devices. method, as well as an objective evaluation method to evaluate the comparability of low contrast resolution when CT scanning equipment is adapted to dose reduction technology.
- 3.Performance evaluation of dual-energy imaging and energy spectrum applications. The purpose is to establish a CT scanning device for dual-energy imaging, or A method for evaluating the performance of relevant images when applying energy spectrum based on images or data obtained from corresponding acquisition modes. Compared with conventional CT imaging methods, CT dual-energy imaging and energy spectrum applications can provide more clinical diagnostic information and can Further optimize image quality in specific scenarios. After sufficient clinical research and practice accumulation in recent years, CT dual-energy imaging and energy spectrum applications The clinical value of applications (such as virtual monochrome images, etc.) has been widely recognized by the radiology community and has gradually entered the standard process of clinical application. Clinical diagnosis and treatment guidelines for specific diseases. At the same time, with the development of CT imaging technology, diversified CT dual-energy imaging modes and energy spectrum applications are also used by more and more CT products. products used. However, due to the diversity of implementation methods of related technologies, there is currently no unified performance evaluation method and standard. About CT Dual The evaluation methods of image quality, dose levels and related

quantitative functions related to energy imaging need to be standardized and normalized. Based on the above status, this document provides a standardized performance evaluation method for CT dual-energy imaging and energy spectrum applications. On the one hand, it can To promote the establishment of a dual-energy imaging performance evaluation system for CT products or related post-processing software products; on the other hand, it can provide clinical When using different CT products or energy spectrum imaging software products for related applications, a method reference for mode selection and parameter adjustment is provided. X-ray computed tomography equipment Image quality evaluation method Part

1 Scope

YY/T 1766.3 specifies how the dual-energy and spectral performance of a CT scanner is evaluated. Spectral CT acquires at two photon energies and uses the difference to separate materials rather than merely measure attenuation, which is what allows iodine maps, virtual non-contrast images, monoenergetic reconstructions and gout or stone characterisation. Conventional CT image quality metrics say nothing about whether those material decompositions are accurate. This part supplies the methods that do: what is measured, on what phantoms, and how the result is reported, so that spectral claims from different vendors can be compared. Spectral CT is the premium segment of a large and competitive Chinese CT market. For a manufacturer, this is the protocol a Chinese registration expects the spectral performance evidence to follow.

This document specifies the dual-energy imaging and energy spectrum applications of X-ray computed tomography equipment (hereinafter referred to as CT scanning equipment) Performance evaluation methods. This document applies to whole-body and dedicated CT scanning devices, including CT scanning devices that provide image data for radiotherapy planning, but does not include Including oral CT scanning devices or angiography and mobile C-arm equipment with three-dimensional imaging capabilities.

2 Normative reference documents

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, the dated quotations For referenced documents without dates, only the version corresponding to that date applies to this document; for undated referenced documents, the latest version (including all amendments) applies to this document. document.

GB 9706.244-2020 Medical electrical equipment Part 2-

44.Basic safety and basic performance of X-ray computed tomography equipment Special requirements

GB/T 10149 Medical X-ray equipment terms and symbols

GB/T 19042.5-2022 Evaluation and routine testing of medical imaging departments Part 3-5.X-ray computed tomography equipment Image performance acceptance test and stability test

YY/T 1766.1-2021 X-ray computed tomography equipment image quality evaluation method Part

3 Terms and definitions

The following terms and definitions as defined in GB/T 10149, GB 9706.244-2020, GB/T 19042.5-2022 apply to this document.

3.1 An imaging method that uses a CT scanning device to obtain data corresponding to a single energy spectrum for image reconstruction and processing. Note

1.The "energy spectrum" here refers to the energy distribution in the traditional physics sense. Note

2.Usually based on a single tube voltage, single filtering, energy integrating detector. Note

3.Imaging with conventional CT scanning devices is usually single-energy imaging.

3.2 CT dual energy imagingdualenergyCTimaging Use a CT scanning device to obtain data corresponding to two energy spectra in a dual-energy imaging process for imaging reconstruction and processing. Way. Note

1.The "energy spectrum" here refers to the energy distribution in the traditional physics sense. Note

2.Different energy spectrum data can be generated and acquired through technology based on ray sources, filtering, and detectors. The current technology implementation method of CT dual-energy imaging