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**Calibration method for the grayscale standard display function
of imaging displays**

影像灰度标准显示函数标定方法

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Foreword

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1 Scope

China's national calibration method for the greyscale standard display function of imaging displays. The function it refers to is the one defined in the DICOM medical imaging standard, and the problem it solves is perceptual rather than photometric. The human eye's ability to distinguish two adjacent grey levels is not constant across the brightness range, so

a display calibrated to a simple linear or gamma relationship shows some parts of an image's range in more perceptible detail than others - which for a radiologist means that a subtle lesion is visible in one part of the greyscale and invisible in another. The standard display function distributes the levels so that each step is equally perceptible, which makes the same image equally readable everywhere and, crucially, the same on every calibrated display. Verifying that a monitor conforms is a routine quality assurance obligation in any imaging department.

This document describes the calibration principle, calibration conditions, calibration materials, instruments and equipment, and calibration of the grayscale standard display function for displaying images in grayscale: Calibration steps, processing of calibration data, uncertainty of calibration (measurement), etc: This document applies to electronic display media (such as monitors, projection display equipment, display screens, etc:) and printed display media used for image display: The grayscale displayed by media (such as printers, printers, etc:) is mainly medical images, and other images can be used as a reference:

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 undated referenced documents, 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: JJG211-2021 Brightness meter JJG452-2021 black and white density film

3 Terms and definitions

The terms and definitions defined in JJG452-2021 and the following apply to this document:
3:1 imagegrayscaleimagegrayscale The calculated gray value corresponding to the pixel in a certain area of the image:

Note 1: Image grayscale is expressed by the brightness of a single-tone color (usually black and white or three primary colors): Measurement of absolute magnitude of image grayscale and specific display of images Media related:

Note 2: Image includes images: A certain area may be single pixel or multi-pixel:

Note 3: The calculated value refers to the processing of the gray value in the area, such as averaging: 3:2 A functional model that represents the quantitative relationship between the brightness perceived by the human eye and the energy of the brightness source:

Note: The independent variable of the function constructing this model is the brightness source of different energies, and the dependent variable is the brightness perceived by the human eye: 3:

3 Indicates the correspondence between the input amount and output amount of the image display medium:

Note: The grayscale standard display function is established based on the human eye brightness vision model: For electronic display media, describes the relationship between input level and display brightness Relationship; for printed display media, describes the relationship between its input level and optical density: [Source: NEMAPS3:14-2009,3, modified] 3:4 brightnessluminance The intensity of luminescence emitted per unit area in a given direction: [Source: NEMAPS3:14-2009,3, modified]