



Standard Practice for Classification of Computed Radiology Systems¹

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1. Scope

1.1 This practice describes the evaluation and classification of a computed radiography (CR) system, a particular phosphor imaging plate (IP), system scanner and software, in combination with specified metal screens for industrial radiography. It is intended to ensure that the evaluation of image quality, as far as this is influenced by the scanner/IP system, meets the needs of users.

1.2 The practice defines system tests to be used to classify the systems of different suppliers and make them comparable for users.

1.3 The CR system performance is described by signal and noise parameters. For film systems, the signal is represented by gradient and the noise by granularity. The signal-to-noise ratio is normalized by the basic spatial resolution of the system and is part of classification. The normalization is given by the scanning aperture of 100 μm diameter for the microphotometer, which is defined in Test Method E 1815 for film system classification. This practice describes how the parameters shall be measured for CR systems.

1.4 The values stated in SI are to be regarded as the standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

E 1316 Terminology for Nondestructive Testing

E 1815 Test Method for Classification of Film Systems for Industrial Radiography

E 2002 Practice for Determining Total Image Unsharpness in Radiology

E 2007 Guide for Computed Radiology (PSL Method)

E 2033 Practice for Computed Radiology (PSL Method)

E 2445 Practice for Qualification of Computed Radiography Systems

3. Terminology

3.1 *Definitions*—The definition of terms relating to gamma- and X-radiology, which appear in Terminology E 1316, Guide E 2007, and Practice E 2033, shall apply to the terms used in this practice.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *computed radiology system (CR system)*—A complete system of a storage phosphor imaging plate (IP), a corresponding read out unit (scanner or reader) and software, which converts the information of the IP into a digital image (see also Guide E 2007).

3.2.2 *computed radiology system class*—A particular group of storage phosphor imaging plate systems, which is characterized by a SNR (signal-to-noise ratio) range shown in Table 1 and by a certain unsharpness range in a specified exposure range.

3.2.3 *ISO speed S_{IPx}* —Defines the speed of a CR system and is calculated from the reciprocal dose value, measured in gray, which is necessary to obtain a specified minimum SNR of a CR system.

3.2.4 *signal-to-noise ratio (SNR)*—Quotient of mean value of the linearized signal intensity and standard deviation of the noise (intensity distribution) at this signal intensity. The SNR depends on the radiation dose and the CR system properties.

3.2.5 *modulation transfer function (MTF)*—The normalized magnitude of the Fourier-transform (FT) of the differentiated edge spread function (ESF) of the linearized PSL (photo stimulated luminescence) intensity, measured perpendicular to a sharp edge. MTF describes the contrast transmission as a function of the object size. In this practice, the MTF characterizes the unsharpness of the CR system. This depends on the scanning system itself and IP-type and cassette employed.

3.2.6 *gain/amplification*—Opto-electrical gain setting of the scanning system.

3.2.7 *linearized signal intensity*—a numerical signal value of a picture element (pixel) of the digital image, which is proportional to the radiation dose. The linearized signal intensity is zero, if the radiation dose is zero.

¹ This practice is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.01 on Radiology (X and Gamma) Method.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.