



Standard Guide for Digital Detector Array Radiology¹

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1. Scope

1.1 This standard is a user guide, which is intended to serve as a tutorial for selection and use of various digital detector array systems nominally composed of the detector array and an imaging system to perform digital radiography. This guide also serves as an in-detail reference for the following standards: Practices E2597, E2698, and E2737.

1.2 *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 determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

E94 Guide for Radiographic Examination

E155 Reference Radiographs for Inspection of Aluminum and Magnesium Castings

E192 Reference Radiographs of Investment Steel Castings for Aerospace Applications

E747 Practice for Design, Manufacture and Material Grouping Classification of Wire Image Quality Indicators (IQI) Used for Radiology

E1000 Guide for Radioscopy

E1025 Practice for Design, Manufacture, and Material Grouping Classification of Hole-Type Image Quality Indicators (IQI) Used for Radiology

E1316 Terminology for Nondestructive Examinations

E1320 Reference Radiographs for Titanium Castings

E1742 Practice for Radiographic Examination

E1815 Test Method for Classification of Film Systems for Industrial Radiography

E1817 Practice for Controlling Quality of Radiological Examination by Using Representative Quality Indicators (RQIs)

E2002 Practice for Determining Total Image Unsharpness in Radiology

E2422 Digital Reference Images for Inspection of Aluminum Castings

E2445 Practice for Performance Evaluation and Long-Term Stability of Computed Radiography Systems

E2446 Practice for Classification of Computed Radiology Systems

E2597 Practice for Manufacturing Characterization of Digital Detector Arrays

E2660 Digital Reference Images for Investment Steel Castings for Aerospace Applications

E2669 Digital Reference Images for Titanium Castings

E2698 Practice for Radiological Examination Using Digital Detector Arrays

E2737 Practice for Digital Detector Array Performance Evaluation and Long-Term Stability

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *digital detector array (DDA) system*—an electronic device that converts ionizing or penetrating radiation into a discrete array of analog signals which are subsequently digitized and transferred to a computer for display as a digital image corresponding to the radiation energy pattern imparted upon the input region of the device. The conversion of the ionizing or penetrating radiation into an electronic signal may transpire by first converting the ionizing or penetrating radiation into visible light through the use of a scintillating material. These devices can range in speed from many minutes per image to many images per second, up to and in excess of real-time radioscopy rates (usually 30 frames per seconds).

3.1.2 *signal-to-noise ratio (SNR)*—quotient of mean value of the intensity (signal) and standard deviation of the intensity (noise). The SNR depends on the radiation dose and the DDA system properties.

3.1.3 *normalized signal-to-noise ratio (SNR_n)*—SNR normalized for basic spatial resolution (see Practice E2445).

3.1.4 *basic spatial resolution (SR_b)*—basic spatial resolution indicates the smallest geometrical detail, which can be resolved using the DDA. It is similar to the effective pixel size.

¹ This guide 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.