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Non-destructive testing — Radiation methods for computed tomography —

Part 1: Vocabulary

Essais non destructifs — Méthodes par rayonnements pour la tomographie informatisée —

Partie 1: Vocabulaire

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Foreword

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This third edition cancels and replaces the second edition (ISO 15708-1:2017), which has been technically revised.

The main changes are as follows:

— correction of term 3.8, 3.9, 3.20 and 3.27.

A list of all parts in the ISO 15708 series can be found on the ISO website.

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Non-destructive testing — Radiation methods for computed tomography —

Part 1: Vocabulary

1 Scope

This document defines terms used in the field of computed tomography (CT). It presents vocabulary that is not only CT-specific but which also includes other more generic terms and definitions spanning imaging and radiography. Some of the definitions represent discussion points aimed at refocusing their terms in the specific context of computed tomography.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
absorption
photoelectric absorption
mode of interaction between photons and matter whereby a photon is absorbed by an atom which then emits an electron whose kinetic energy is exactly equal to the energy-depleted photon's electron-binding energy

Note 1 to entry: See also *Compton scattering* (3.6).

3.2
angular increment
angular spacing between adjacent *CT projections* (3.12)

3.3
artefact
artificial feature which appears on the *CT image* (3.11) but does not correspond to a physical feature of the object

3.4
beam hardening
spectrum hardening
spectral change of a polychromatic beam caused by preferential attenuation of low energy photons

Note 1 to entry: See also *cupping effect* (3.17).

3.5
calibration template
phantom
known reference object that is scanned to assess the performance of a *CT system* (3.15)

3.6
Compton scattering
mode of interaction between a photon and an electron, where the photon is scattered with reduced energy, and the difference of energy is transferred to the electron, also known as inelastic scattering or incoherent scattering

Note 1 to entry: See also *photoelectric absorption* (3.1).

3.7
computed tomography
CT
computed axial tomography
radiographic scanning technique that uses a number of *CT projections* (3.12) of an object at different angles in order to allow calculation of a *CT image* (3.11)

3.8
cone beam CT
scanning mode wherein each *CT projection* (3.12) is built from a set of *ray paths* (3.24) emanating from a point source and diverging in two dimensions, thereby forming a cone

3.9
CT data
CT dataset
CT projections (3.12) recorded using a *CT scan* (3.13) or *CT image* (3.11) obtained by *reconstruction* (3.25)

3.10
CT grey value
grey level
numerical value assigned to each *voxel* (3.30) in a *CT image* (3.11)

Note 1 to entry: This value represents the average *linear attenuation coefficient* (3.20) of the object volume for that voxel.

3.11
CT image
tomogram
2D or 3D image of the *CT grey values* (3.10) obtained by *reconstruction* (3.25)

3.12
CT projection
1D or 2D radiographic image

3.13
CT scan
set of relative movements between sample, source and detector, and the acquisition necessary to obtain a set of *CT projections* (3.12) that can be reconstructed into a *CT image* (3.11)

3.14
CT slice
2D *CT image* (3.11) with a finite thickness along a given plane

Note 1 to entry: See also *slice thickness* (3.29).

3.15
CT system
tomograph
equipment used to produce *CT images* (3.11)

3.16
CT volume
3D *CT image* (3.11)

3.17
cupping effect
feature due to *beam hardening* (3.4) in which the *CT grey values* (3.10) in a *CT image* (3.11) towards the centre of a homogeneous object are lower than those closer to the surface

3.18
density resolution
measure of the extent to which a *CT image* (3.11) can be used to detect differences in the *linear attenuation coefficient* (3.20)

3.19
fan beam CT
scanning mode wherein each *CT projection* (3.12) is built from a set of *ray paths* (3.24) emanating from a point source but considered to be diverging in only one dimension, thereby forming a 'fan'

3.20
linear attenuation coefficient
X-ray attenuation (3.31) per unit path length of material at a certain radiation energy range

Note 1 to entry: It is often expressed in cm^{-1}.

3.21
parallel beam CT
scanning mode wherein each *CT projection* (3.12) is built from a set of parallel *ray paths* (3.24)

3.22
partial volume effect
effect due to the finite voxel size of *CT images* (3.11) where properties of different materials are averaged within a single *voxel* (3.30)

3.23
pixel
basic cell area in a 2D image or detector

Note 1 to entry: See also *voxel* (3.30).

3.24
ray path
path that an X-ray travels from the source to a given detector *pixel* (3.23)

3.25
reconstruction
process of transforming a set of *CT projections* (3.12) into a *CT image* (3.11)

3.26
region of interest
ROI
sub-volume within an object or a *CT image* (3.11)

3.27
region of interest CT
local tomography
CT image (3.11) of a *region of interest* (3.26) (ROI) of an object using a set of *CT projections* (3.12) in which parts outside the ROI are not imaged in all of the *CT projections*

3.28
sinogram
image formed by stacking vertically a set of 1D *CT projections* (3.12) from a complete set of angular positions in order of increasing projection angle

3.29
slice thickness
effective thickness of the X-ray beam in 2D tomography (i.e. that part of the X-ray beam that reaches the detector) measured at the centre of the object

3.30
voxel
volume element of a *CT image* (3.11) to which a *CT grey value* (3.10) is assigned

Note 1 to entry: It is the 3D equivalent of a *pixel* (3.23).

3.31
X-ray attenuation
reduction in the intensity of X-rays as they pass through matter due to a combination of absorption and scattering

Note 1 to entry: See also *linear attenuation coefficient* (3.20).