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Radiation protection instrumentation – Security screening of humans – Measuring the imaging performance of X-ray systems

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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RADIATION PROTECTION INSTRUMENTATION – SECURITY SCREENING OF HUMANS – MEASURING THE IMAGING PERFORMANCE OF X-RAY SYSTEMS

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IEC 62709 has been prepared by subcommittee 45B: Radiation protection instrumentation, of IEC technical committee 45: Nuclear instrumentation. It is an International Standard.

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Clarified the test procedures to maintain consistency with IEC 62463.
b) Changed the term "spatial resolution" to "pentalith resolution".
c) Modified some standard test conditions.
d) Modified some terms and definitions.
e) Changed the imaging requirements for transmission general-use systems.

The text of this International Standard is based on the following documents:

Draft	Report on voting
45B/1059/FDIS	45B/1069/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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INTRODUCTION

This document establishes standard test methods and test objects for measuring the imaging performance of X-ray systems for security screening of humans. For each image quality test, this document also sets minimum acceptable levels of performance. These procedures and minimum acceptable requirements should not be construed as an all-inclusive measure of performance for any situation. Depending on the circumstances and detection needs, user institutions will continue to generate their own requirements and are encouraged to do so. Rather, it is hoped that this document will provide a starting point for evaluating systems, provide a uniform set of readily available information to compare equipment, and offer a standard procedure for periodic quality control testing.

Four annexes are included. Annex A (normative) provides mechanical drawings of the imaging test objects. Sample test report forms are given in Annex B (informative). Annex C (informative) provides a generic description of the pentalith~~, the spatial~~ resolution test object. Annex D (informative) seeks to describe the different types of security systems presently being used for whole-body imaging.

RADIATION PROTECTION INSTRUMENTATION – SECURITY SCREENING OF HUMANS – MEASURING THE IMAGING PERFORMANCE OF X-RAY SYSTEMS

1 Scope ~~and object~~

This document applies to security screening systems that utilize X-ray radiation and are used to inspect people who are not inside vehicles, containers, or enclosures. Specifically, this document applies to systems used to detect objects carried on or within the body of the individual being inspected. ~~This standard does not include requirements related to electromagnetic compatibility, radiological, electrical and mechanical safety. These requirements are covered in IEC 62463:2010.~~

The following types of systems are included in the scope of this document:

– Systems designated as ~~fixed, portal, transportable,~~ mobile or ~~gantry~~ fixed.

– Systems employing detection of primary radiation, backscattered radiation, forward-scattered radiation, (see Annex D) or some combination of these modalities to form two-dimensional X-ray images.

– Systems that are primarily imaging but that also may have complementary features such as material discrimination, automatic active or passive detection alerts. This document does not address how to test these complementary features.

The objective is to provide standard methods of measuring and reporting imaging quality characteristics that enable system manufacturers, potential system users and other interested parties to:

a) Establish a consistent indicator of the expected technical performance of screening systems used for the inspection of individuals. Such technical performance testing complements explicit detection testing and evaluation. In this document "detection" refers to items in an image.

b) Provide repeatable and verifiable imaging performance data that can be used to compare systems from different vendors.

c) Establish a baseline that can be used over time to calibrate the system or detect any performance degradation. (It is not intended that the entire test method be employed for daily quality assurance testing.)

d) Establish minimum acceptable performance requirements for the systems described above.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

~~NOTE Users of this standard should note that standards referenced herein may not fulfil the legal requirements and practices in all countries, or jurisdictions. Care should be taken to ensure regulatory compliance.~~

~~IEC 60050-393:2003, *International Electrotechnical Vocabulary (IEV) – Part 393: Nuclear instrumentation – Physical phenomena and basic concepts*~~

~~IEC 60050-394:2007, *International Electrotechnical Vocabulary (IEV) – Part 394: Nuclear instrumentation – instruments, systems, equipment and detectors*~~

IEC 60050-395:2014, *International Electrotechnical Vocabulary (IEV) – Part 395: Nuclear instrumentation – Physical phenomena, basic concepts, instruments, systems, equipment and detectors*
IEC 60050-395:2014/AMD1:2016
IEC 60050-395:2014/AMD2:2020

IEC 60050-881:1983, *International Electrotechnical Vocabulary (IEV) – Part 881: Radiology and radiological physics*
IEC 60050-881:1983/AMD1:2014
IEC 60050-881:1983/AMD2:2019
IEC 60050-881:1983/AMD3:2020

IEC 62463:~~2010~~2024, *Radiation protection instrumentation – X-ray systems for the security screening of persons ~~for security and the carrying of illicit items~~*

ISO 683-17:~~1999~~2023, *Heat-~~treated~~treatable steels, alloy steels and free-cutting steels – Part 17: Ball and roller bearing steels*

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IEC 62709:2024-09(en)

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