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Part 42-10: Measurement methods of motion-tracking image-control response time for interactive projection display

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



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COMMITTEE DRAFT (CD)

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SECRETARY:

Mr Yoshi SHIBAHARA

OF INTEREST TO THE FOLLOWING COMMITTEES:

TC 76

PROPOSED HORIZONTAL STANDARD:

☐

Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC

☐ ENVIRONMENT

☐ QUALITY ASSURANCE

☐ SAFETY

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Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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TITLE:

Touch and interactive displays - Part 42-10: Measurement methods of motion-tracking image-control response time for interactive projection display

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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TOUCH AND INTERACTIVE DISPLAYS

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Part 42-10: Measurement methods of motion-tracking image-control response time for interactive projection display

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FOREWORD

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IEC 62908-42-10 has been prepared by IEC technical committee TC 110: Electronic displays. It is an International Standard,

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

Draft	Report on voting
XX/XX/FDIS	XX/XX/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

133 www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in
134 greater detail at www.iec.ch/standardsdev/publications.

135 The committee has decided that the contents of this document will remain unchanged until the stability
136 date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific
137 document. At this date, the document will be

- 138 • reconfirmed,
- 139 • withdrawn,
- 140 • replaced by a revised edition, or
- 141 • amended.

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INTRODUCTION

Projection displays have a distinct feature of separating the projection device (projector) from the projected image on a screen. In this international standard, the projector is defined as the first object, and the screen image is defined as the second object. This configuration can give rise to freedom of motions of the first and the second objects, or the third objects in a space between them. That is, the projection displays can interactively track the motions of the first, the second, or the third objects by a sensing device such as a camera, a LiDAR, and so on. As a result, the interactive projection displays with the motion-tracking system create new applications, such as image projection (projection mapping) from moving objects (e.g., vehicles, drones), projection mapping onto moving objects (e.g., dancers), interactive Image control by human motions, or protecting a human body moving into a region of high-intensity light exposure from photobiological damage.

The response time (latency) of the motion-tracking image control system is a key performance of the above interactive projection displays. Particularly for quick shut-down systems for ensuring safety, the response time is safety critical. Some of advanced systems can track various complicated motions. However, this international standard provides fundamental measurement methods of measuring the response time of the motion-tracking image control systems, in which the image is controlled corresponding to simple motions. The measurements can be carried out simply using small patters, photodiodes (PD), and a high-speed oscilloscope. The complicated motions specific to the advanced are not included in this international standard. They are categorized as specific measurements for the customized specifications.

There are various types of projection displays, such as full-frame projection displays using a lamp, LEDs, hybrid phosphor / laser, or RGB lasers as light sources, raster-scanning RGB laser projection displays [1]¹, [2], [3] etc. This international standard is applicable to such various projection displays which can interactively control the image via motion-tracking sensors.

¹ Numbers in square brackets refer to the Bibliography.

TOUCH AND INTERACTIVE DISPLAYS

Part 42-10: Measurement methods of motion-tracking image-control response time for interactive projection display

1 Scope

This part of IEC62908-42-10 specifies standard measurement conditions and fundamental measurement methods of response time of interactive projection displays with sensors detecting the motion of the projector, the projected image on the object / screen, or the third objects, interactively controlling the projection image responding to the motions.

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.

IEC 60825-1, *Safety of laser products – Part 1: Equipment classification and requirements*

IEC 62471-5, *Photobiological safety of lamps and lamp systems Part 5: Image projectors*

3 Terms, definitions, abbreviated terms and letter symbols

For the purposes of this document, the following terms and definitions given in IEC 62906-1-2, IEC 62908-1-2 and the following apply.

For the purposes of this document, the following terms and definitions apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Terms and definitions

3.1.1

first object

projector part projecting images on a screen, which has a function of controlling projection images

3.1.2

second object

screen part including a living form, on which images are projected by the first object (projector part)

3.1.3

third object

parts including living forms existing or intruding into the space between the first object (projector part) and the second object (screen part)

3.1.4

motion-tracking image-control interactive projection display

image projection system with a projector part (first object) projecting images on a screen part (second object), which has a function of controlling the images projected on the second object or the light emission of the projector part, corresponding to the motion of the first object, the second object, or the third objects in the space between the first and the second objects which is detected by motion sensors equipped with the first object.

3.2 Abbreviated terms

ADC -	analogue-to-digital converter
DUT -	device under test
LMD -	light measuring device
LiDAR -	light detection and ranging
PD -	photodiode / photodetector
RGB -	red, green, blue
SLM -	spatial light modulator
TOF -	time of flight

3.3 Letter symbols

The letter symbols are shown in エラー! 参照元が見つかりません。

Table 1 – Letter symbols

item	Letter symbol	unit
Response time	Δt	s
Distance between the 1 st and the 2 nd objects	D_{2nd}	m
Distance between the 1 st and the 3 rd objects	D_{3rd}	m
Azimuth angle for PD1, PD2, and the 3 rd object	$\phi_{1,2,3}$	degree
Zenith for PD1, PD2, and the 3 rd object	$\theta_{1,2,3}$	degree

4 Principle

The DUT for the measurement in this document is a projection display with an interactive motion-tracking image-control system. The system has a device sensing the motion of the first object (the DUT itself), the second object (the image-projection screen), or the third objects in the sensing area. The examples of the sensing devices are a camera, a LiDAR system (see Annex C), and so on. The system also has an image control function. That is, the image is controlled by the software program to achieve the required performance. The range of the performance level varies from a simple correction of the image position to advanced smart image control by sensing detailed motions of the objects, depending on the purpose of the product.

This document specifies the measurement methods of the response time (latency) of the motion-tracking image-control system loaded on the first object (DUT), focusing on the fundamental measurements assuming simple motions. The response time measurements of every single customised specific motion in the advanced smart systems cannot be covered in this document. Therefore, the fundamental measurement methods in this document are simply carried out using small projected patterns, photodiodes (PDs), and a high-speed oscilloscope. (See also INTRODUCTION, 3.1.4, and 8.1.)

5 Standard measuring conditions

5.1 General

Unless stated otherwise, the following conditions shall be applied.