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Part 2: Variable resolution projectors

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Part 2: Variable resolution projectors

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CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Definitions 8
4 General requirements 12
5 Light output measurement and specification 13
5.1 Light output specifications 14
5.1.1 Light output specification for projectors with a separate screen 14
5.1.2 Full-black light level specification 15
5.1.3 Luminance specification for devices with an integral screen 15
5.2 Light output uniformity 15
5.2.1 Example of a uniformity specification 15
5.3 Contrast ratio 15
5.4 Blanking measurement and specification 15
5.5 Effective blanking time 16
5.6 Blanking specification 16
6 Variable resolution projector characteristics 17
6.1 Visual resolution measurement and specification 17
6.1.1 Description and general requirements 17
6.1.2 Horizontal resolution 17
6.1.3 Vertical resolution 18
6.1.4 Procedure 18
6.2 Video frequency response specifications 20
6.2.1 Frequency response specifications 20
6.3 Viewing angle (half/gain) specification for devices with an integral screen 20
6.4 Input signal format compatibility 20
6.5 Response time 20
6.6 Colour measurements 21
6.6.1 Colour chromaticity 21
6.6.2 Colour uniformity 21
6.7 Keystone correction 22
7 Range of focus and image size 22
8 Audio characteristics 22
9 Light source specification 22
10 Noise: maximum sound level 23
11 Power consumption 23
12 Weight 23
13 Dimensions 23
14 Recommended practices 23
14.1 Recommended practice 1 – Sync hierarchy 23
14.2 Recommended practice 2 – DC restoration 23
14.3 Recommended practice 3 – Sync 24
14.4 Recommended practice 4 – Scan range labelling 24

Annex A (normative) Figures 25
Annex B (normative) Pattern generator specifications 29
Annex C (informative) Considerations in formulating this standard 30
C.1 General 30
C.2 Light output measurement 30
C.3 Visual resolution measurement 31
C.4 Possible causes for measurement errors 31
C.5 Input signal levels 31
Annex D (normative) Complete sample specification 33
Annex E (informative) Other issues, outside the scope of this standard, that may affect picture clarity 35
Annex F (informative) Possible causes of photometric measurement errors 36
F.1 Size of measured spot 36
F.2 Colour measurement 36
Annex G (normative) Alternative method for measuring resolution using the NIDL grille contrast method 37
Annex H (informative) Photometer precision and veiling glare 39
H.1 Photometer precision 39
H.2 Integration time 39
H.3 Veiling glare 39
Annex I (informative) Light measuring devices 41
Annex J (informative) Figure of merit for projection display colour gamut 42
Bibliography 44

Figure A.1 – Test patterns/measurements set-up 25
Figure A.2 – Thirteen-point measuring grid 26
Figure A.3 – Contrast measurement 26
Figure A.4 – Vertical alternating lines 26
Figure A.5 – Horizontal alternating lines 27
Figure A.6 – Resolution equipment set-up/depth of modulation measurement 27
Figure A.7 – Sync and blanking timing 28
Figure C.1 – Simulation of lowered resolution 32

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTRONIC PROJECTION – MEASUREMENT AND DOCUMENTATION OF KEY PERFORMANCE CRITERIA –

Part 2: Variable resolution projectors

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61947-2 has been prepared by subcommittee 100C: Audio, video and multimedia subsystems and equipment, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this standard is based on the following documents:

FDIS	Report on voting
100/268/FDIS	100/418/RVD

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

Annexes A, B, D, and G form an integral part of this standard.

Annexes C, E, F, H, I and J are for information only.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

The committee has decided that the contents of this publication will remain unchanged until 2004. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

This standard was developed to ensure a common, meaningful description of key performance parameters for variable resolution projectors (for example, CRT or laser projectors). The measurement methods and test signals correlate closely to typical uses involving computer-generated text and graphics displays. These measurements evaluate the actual viewable image that emanates from variable resolution projectors. The resulting performance specifications are conservative in nature and allow any display device to be used beyond its rated specifications with degraded performance. The point at which this degraded performance is no longer useful is highly subjective and strongly affected by the environment and the application.

This standard is designed to specify a means of measuring and quantifying the performance of variable resolution projectors and is not intended to provide design goals for manufacturers of such equipment.

ELECTRONIC PROJECTION – MEASUREMENT AND DOCUMENTATION OF KEY PERFORMANCE CRITERIA –

Part 2: Variable resolution projectors

1 Scope

This part of IEC 61947 specifies requirements for measuring and documenting key performance parameters for CRT and laser-based projectors and other variable resolution projectors that are capable of multiple variable resolutions and in which the image is raster-scanned.

The provisions of this standard are designed to codify the measurement of the performance of variable resolution projectors and are not intended to provide design goals for manufacturers of such equipment.

This standard is intended for variable resolution projectors (including projection displays that are capable of multiple variable resolutions) that are designed for use with primarily discrete colour (RGB) raster-scanned video, text, and graphics signals generated by computer equipment.

NOTE These devices may also accept composite or component television video signals encoded to NTSC/RS170A, PAL, SECAM, or future HDTV, or ATV standards, which are fully described in their respective documentation and are not within the scope of this part of IEC 61947. In this part of IEC 61947, all of these signals are referred to as television video (TV video) (see IEC 60107-1 [27]).

Displays with fixed resolutions (i.e. individual pixel light sources or matrix displays such as liquid crystal, DMD, plasma, or electroluminescent panels), are not fully addressed by this standard, and reference should be made to IEC 61947-1.

Factors outside the scope of this standard that may have a bearing on projector performance are listed in annex E. A discussion of considerations informing the development of standard appears in annex C.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61947. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61947 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(845):1987, *International Electrotechnical Vocabulary (IEV) – Chapter 845: Lighting*

IEC 61947-1, *Electronic projection – Measurement and documentation of key performance criteria – Part 1: Fixed resolution projectors*[1)]

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1) To be published.

ISO 3741:1999, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision methods for reverberation rooms*

ISO 7779:1999, *Acoustics – Measurement of airborne noise emitted by information technology and telecommunications equipment*

3 Definitions

For the purposes of this part of IEC 61947, the following definitions apply.

3.1
active matrix display
display that uses switches at each pixel to select those pixels to which a voltage will be applied

3.2
active viewing area
horizontal and vertical dimensions in millimetres (inches) of the boundary of the array of pixels. It may also be expressed in square millimetres or square inches

3.3
aperture ratio (fill factor)
light transmitting/reflecting area of a pixel times the number of pixels divided by the active viewing area (light transmitting area and light blocking area)

3.4
aspect ratio
proportions of a projected picture area, for example, the width compared to the height. It is usually expressed in standard ratios such as 4:3, 16:9, or others

3.5
blanking
process of the beam turning off (blanking) which occurs during horizontal and vertical retrace (flyback)

3.6
CIE
Commission Internationale de l'Eclairage (International Commission on Illumination)

NOTE The CIE is an organization devoted to international cooperation and exchange of information among its member countries on all matters relating to the art and science of lighting.

3.7
CIE chromaticity values
Cartesian coordinates used to define a colour in CIE colour space

NOTE The 1931 chromaticity values are designated x and y. In 1976, the CIE defined a more uniform colour space. The 1976 CIE chromaticity values are u′ and v′.

3.8
colour mapping
means for accurately displaying colour signals or altering sets of colour signals in a controlled manner

3.9
contrast ratio
luminance or illuminance ratio of a light area of the image to the dark area of the same image

3.10
correlated colour temperature (CCT) of the white-point
temperature, in kelvins, of the black-body radiator, the chromaticity of which is closest to the chromaticity of a particular light, for example from a display screen, as measured in the 1960 CIE (u, v) uniform chromaticity space

NOTE An algorithm for computing the CCT of the white-point, either from 1931 CIE (x, y) coordinates or from 1960 (u, v) coordinates, appears in Wyszecki and Stiles [1]. A graphical nomogram also appears in this work. Alternatively, a successful numerical approximation has been derived by C. S. McCamy [2]. Given CIE 1931 coordinates (x, y), McCamy's approximation is CCT = 437 n3 + 3 601 n2 + 6 831 n + 5 517, where n = (x - 0,3320)/(0,1858 – y). This approximation, the second of three proposed, is close enough for any practical use between 2 000 K and 10 000 K. In units of 1960 u ,v chromaticity, it is agreed that the concept of CCT of the white-point has little meaning beyond the distance of 0,01 from the Planckian locus (see Robinson et al [3]), where the distance is specified by

$$\Delta uv = \sqrt{(u_1 - u_2)^2 + (v_1 - v_2)^2}$$

Most commercial colourimeters will report the CCT of the white-point from 0,0175 u, v units above the Planckian locus to 0,014 u, v units below this locus.

3.11
digital micromirror device (DMD)
semiconductor light micromirror array. The DMD can switch incident light on or off in discrete pixels within microseconds to produce projection display systems

3.12
optical distortion
situation in which an image is not a true-to-scale reproduction of an object due to the optics of the system

NOTE There are many types of distortion, such as anamorphic, barrel, curvilinear, geometric, keystone, panoramic, perspective, radial, stereoscopic, tangential, and wide-angle.

3.13
f/number
focal length of a projection lens divided by the diameter of the lens aperture

3.14
fall time
time, in milliseconds, for the image brightness to change from 90 % of its maximum value to 10 % of its maximum value

3.15
focal length
distance between the centre of the focusing lens or mirror and the focal spot. Shorter focal length projection lenses produce larger screen images for a given distance from the screen

3.16
focus
adjustment of an optical system to achieve the greatest possible sharpness

3.17
four corners
centres of the four corner points (see figure A.2), located at 10 % of the distance from the corners to the centre of point 5

3.18
front screen projection
image projected on the audience side of a light-reflecting screen

3.19
illuminance
quotient of a luminous flux incident on an element of the surface containing the point by the area of that element.

Unit: lux (lx)

3.20
light source life expectancy
time that the light source can keep its projected light output as measured in this standard, higher than 50 % of the initial value when tested with a duty cycle of 2 h on and 15 min off

3.21
liquid-crystal display (LCD)
display made of material, the reflectance or transmittance of which changes when an electric field is applied

3.22
luminance
luminance (L) in a given direction is the luminous intensity per unit of projected area of any surface, as viewed for that direction

Unit: candela per square metre (cd/m^2)

3.23
luminous flux
quantity derived from radiant flux by evaluating the radiation according to its action upon a selective receptor, the spectral sensitivity of which is defined by the standard 1931 CIE spectral luminance efficiency function for the photopic V(λ) function

NOTE Quantity of light expressed in lumens and directed in a given direction.

3.24
luminous intensity
luminous flux per unit solid angle emitted or reflected from a point source

Unit: candela

3.25
object
slide or transmissive/reflective image forming panel, such as an LCD, that is illuminated and imaged by the optics onto a viewing screen

3.26
peak angle
angle at which maximum luminance is observed

3.27
photometric units
units of light measurement based on the response of the average human observer. The response of the average human observer is defined by the 1931 CIE spectral luminance efficiency function for the photopic V(λ) function

3.28
pixel
smallest element of a display space that can be independently assigned a colour or intensity