



OCTOBER 1981

TEST CRITERIA
FOR
X-RAY IMAGE INTENSIFIER TUBES

FORMULATED BY
EIA TUBE ENGINEERING PANEL ADVISORY COUNCIL
(TEPAC)

TEPAC PUBLICATION No. 109
(Revision of TEPAC Suggested Standard No. 9)



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This document has been developed to recommend a standardized method of measurement of x-radiation from CRT's for tube manufacturer compliance with HHS Bureau of Radiological Health Regulations on this subject.

Published by

ELECTRONIC INDUSTRIES ASSOCIATION
Engineering Department
2001 Eye Street, N.W.
Washington, D.C. 20006

PRICE: \$5.50

Printed in U.S.A.



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PREFACE

The material herein was developed by the JT-4 Committee on Photosensitive Electron Tubes and previously issued in the form of a JEDEC Suggested Standard entitled "Test Standard for X-Ray Image Intensifier Tubes" (JEDEC Suggested Standard No. 9, dated March 1969).

The document was transferred to the JT-20 Committee on Electro-Optic Devices who reaffirmed the publication for distribution under the cognizance of the EIA Tube Engineering Panel Advisory Council (TEPAC) as TEPAC Publication No. 109.

TEST CRITERIA
FOR
X-RAY IMAGE INTENSIFIER TUBES

1.0 Purpose and Scope

- 1.1 This document provides recommended test methods for the measurement and ratings of X-ray image intensifier tubes.

CAUTION: SAFETY CONSIDERATIONS

Measuring instruments should be properly grounded.

Caution should be taken to avoid shock hazard, particularly in the vicinity of the anode connection and the voltage metering systems.

Safety glasses should be worn at all times during the measurement procedure.

X-ray film badges should be worn in accordance with established plant safety practices for monitoring radiation dosage.

2.0 Definitions

- 2.1 X-ray Image Intensifier Tube - A vacuum tube containing an input screen which converts an X-ray pattern into an electron pattern and in which the electrons are accelerated and focused on to an output screen which converts the electron pattern into a light image of brightness greater than that of a fluoroscope screen.
- 2.2 Useful Area - The area of the input plane enclosed by a circle having a radius over which the resolution is specified (see Fig.1).
- 2.3 Useful Field Diameter - The diameter of the X-ray beam, measured at the location of the object, which produces an X-ray shadow covering the useful area (see Fig. 1).
- 2.4 Image Quality - The faithfulness of the reproduction of an X-ray pattern (see definitions 2.8 and 2.9).
- 2.5 Input Screen - The surface, either flat or curved, in which X-radiation is absorbed and in which the X-ray image is converted into either an image of fluorescent light or of electric charge.

- 2.6 Output Screen - The surface in which is located the phosphor which displays a light image.
- 2.7 Conversion Factor - The quotient of the brightness in foot lamberts (or candelas/m²) at the output screen by the input radiation in mR/minute. The P number phosphor of the output screen and the quality of the input radiation must be specified.
- 1 candela/m² = 0.2919 foot lambert.
1 foot lambert = 3.426 candela/m².
- 2.8 Maximum Resolving Power - The number of space and bar combinations per cm (inch) of high x-ray contrast at the entrance plane such that the bars still can be discerned visually as separate entities at the output screen.
- 2.9 Minimum Visible Contrast - The difference in thickness of the X-ray absorption filter expressed as a percentage of the maximum thickness that produces a perceptible difference in brightness on the output screen at a specified exposure rate (see Fig. 7).
- 2.10 The Entrance Plane - The plane in front of the input screen, through which, according to the specifications of the manufacturer, no part of the image intensifier will protrude (see Fig. 1).
- 3.0 Measurements - For the evaluation of an X-ray Image Intensifier, the following measurements shall be made:
- 1) Useful Area
 - 2) Image Quality
 - 3) Conversion Factor
- 3.1 The Useful Area
- 3.1.1 Place an X-ray tube at a distance of 71 cm (28 inches) from the entrance plane.
- 3.1.2 Confine the X-ray beam in order to irradiate exactly the useful area.
- 3.1.3 Measure the diameter of the X-ray beam at the entrance plane = a cm (inches).