ITS-IP
Universal station for testing image intensifier tubes

Fig. 1. ITS-IP test station

BASIC INFORMATION:
Inframet recommends a set of three test stations for expanded testing of image intensifier tubes. ITS-I station for measurement image quality parameters (resolution, MTF, SNR, blemishes, halo, image alignment, etc); ITS-P station for measurement of photometric/temporal parameters (photocathode luminous sensitivity, photocathode radiometric sensitivity, luminance gain, output brightness, EBI, phosphor decay time, rise time, decay time, etc), ITS-R station for reliability tests (Bright Spot Protection, Burn Ins, Reliability tests). These stations enable testing both potted tubes (encapsulated II tubes powered from low voltage supply) and bare tubes (modules before encapsulation powered from high voltage power supplies). Therefore, earlier mentioned set of test stations can be used by manufacturers, test laboratories, repairing workshops at different stages of life of II tubes. Inframet can offer also most advanced ITS-IP test station that combines capabilities of ITS-I station (image quality tests) with some capabilities of ITS-P station (measurement of photometric parameters of potted II tubes).

HOW IT WORKS:
1. The station projects images of some standard targets to tube photocathode plane and measures distortion of the output images of these targets created at the tube screen.
2. The station illuminates tube photocathode with precisely controlled light flux and measures output intensity at the tube screen.

The test procedures used by the ITS-IP station are based on recommendations of the MIL series military standards.

TEST CAPABILITIES:
1. Image quality parameter: Resolution (center, peripheral, high level), Modulation Transfer Function (MTF), Signal To Noise Ratio (S/N), Halo, Useful cathode diameter, Dark and bright spots, Output Brightness Uniformity, Alignment, Distortion, Multi-Multi Pattern Noise, Multi-Boundary Pattern Noise, Image Inversion, Magnification.
2. Photometric parameters: luminance gain, saturation level (maximal output brightness), EBI (optionally also photocathode luminous sensitivity and radiometric sensitivity).

• INFRAMET
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FEATURES:
- Computerized test station. Semi-automatic easy measurement of the above mentioned parameters.
- Modern compact design (not a collection of different laboratory modules to be assembled on a table)
- Testing II, III and IV generation tubes
- High resolution and stability of illuminance regulation
- ITS-I station can be offered in different versions offering different measurement capabilities
- Both 18mm, 25mm and 16mm tubes can be tested.

SPECIFICATIONS

Main modules:
1) Base blocks, 2) Set of measuring tools 3)System for data processing and recording
Ad1) BM-IP base module, OS-1 stage, set of 3 adapters, set of cables for potted tubes,
Ad 2) VM-I video microscope, DC digital camera, M-I microscope, LP1 luminance probe, LP2 luminance probe, CP current probe
Ad 3)PC, frame grabber, TAS-IP program, ITS Display program, MC Viewer program

1. BM I base module

1.1 Light source

Light Source
Dual: 1)polychromatic 2850K color temperature halogen source 2)monochromatic 595nm LED light source

Spectral band of halogen light source
400-1000nm
Illuminance range
10^7 lx to 20 lx
Regulation resolution
0.05 Jux (at low intensity range)
Light regulation type
continuous
Regulation stability
better than 2% of the set value
Illuminance uncertainty
better than 5% of the set value

1.2 Projector of test patterns

Type of macro projector
Custom designed refractive objective
Resolution of target projector
≥400 [1p/mm]
Target change mechanism
manual
Number of test patterns
7
Target
single multi-pattern target having the following patterns: USAF1951 pattern, edge/slit pattern, pinhole pattern, tube diameter pattern, gross/shear distortion pattern, uniform pattern

Maximal acceptable diameter of photocathode of tested II tube
25 mm
Spatial frequencies of resolution targets
16, 17.95, 20.16, 22.62, 25.39, 28.5, 32, 36.0, 40.3, 45.3, 47.9, 50.8, 53.8, 57, 60.4, 64.0, 67.8, 71.8, 76.1, 80, 6 lp/mm
Tube holders
optimized for the following tubes: MX-10160, MX-10130, MX-11620, MX-9444 (other types are also possible – diameters up to 25mm)

LV power source
DC 2.7 V
Type of tube holders
exchangeable holders for 18 mm and 25 mm tubes

2. Set of measuring tools

2.1. VM-I video microscope

For analysis of small parts of screen of II tubes. It enables measurement of the following parameters: resolution, MTF, SNR, halo, distortion, image non alignment

VM-I video microscope type
high resolution, high sensitivity CCD camera integrated with custom macro objective, custom image processing electronics
Image resolution
768 x 576
### Universal station for testing image intensifier tubes

**Field of view**
1.97 x 1.49 mm

**Max magnification**
200x

**2.2 DC-I digital still camera**
For analysis of images from entire area of screen of II tubes. It enables measurement blemishes, photocathode diameter, distortion, non uniformity

- **Type of DC-I camera**
  High resolution digital camera with custom designed objectives
- **Image resolution**
  2554x1944 [5 MPx]
- **Depth of focus**
  Over 3.9 mm (optimized for testing tubes with curved screens)
- **Field of view**
  Dual FOV (optimized for 18mm and 25 mm II tubes)
- **FOV at 18 mm mode**
  >25.3 x 19 mm
- **FOV at 25 mm mode**
  >34.6 x 26 mm
- **PC communication**
  Yes. USB 2.0

**2.3 Monocular microscope**
To be used for resolution measurement, image quality evaluation, and photocathode diameter measurement

- **M-I microscope type**
  custom designed high-res mono microscope
- **M-I microscope magnification**
  50x
- **Measurement resolution range**
  Up to 114 lp/mm

**2.4 LP1 luminance probe**

- **Spectral range**
  similar to human eye
- **Measurement range**
  0.05 cd/m² - 5000 cd/m²
- **Resolution**
  <0.01 cd/m²
- **Measurement uncertainty**
  <5%

**2.5 LP2 luminance probe**

- **Type**
  intensified silicon photodiode
- **Measurement range (linear range)**
  10 μcd/m² - 10 mcd/m²
- **Resolution**
  <0.01 μcd/m²

**2.6 CP current probe**

- **Current measurement range**
  10 pA - 100μA
- **Current resolution**
  5 pA

**Other parameters**

- **Power**
  AC230/110 V 50/60 Hz (DC12V option)
- **Operating temperature**
  5°C to 40°C
- **Storage temperature**
  -5°C to 60°C
- **Humidity**
  Up to 98% (non condensing)
- **Mass**
  <85 kg (including PC set)
- **Dimensions**
  Overall dimensions: 1300x600x730mm

*specifications are subject to change without prior notice*
VERSIONS OF ITS-IP TEST STATION
ITS-IP test station can be delivered in different versions optimized for different customers. Both measurement capability and price depends significantly on version number.

<table>
<thead>
<tr>
<th>Version</th>
<th>List of measured parameters</th>
<th>Blocks of test station</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITS-IP/A</td>
<td>Resolution, luminance gain, power consumption</td>
<td>BM-IP/A base module, M-I microscope, VM-I video microscope, OS-1 stage, set of 3 holders for potted tubes, PC, frame grabber, TAS-IP/A computer program, ITS Display computer program, LP1 luminance probe</td>
</tr>
<tr>
<td>ITS-IP/B</td>
<td>Resolution (center, peripheral, high level), blemishes (dark and bright spots), photocathode cathode diameter, gross distortion, output brightness non uniformity, power consumption, luminance gain, maximal output brightness</td>
<td>BM-IP/B base module, M-I microscope, VM-I video microscope, DC-I camera, OS-1, set of 3 holders for potted tubes, PC, frame grabber, TAS-IP/B computer program, ITS Display computer program, LP1 luminance probe</td>
</tr>
<tr>
<td>ITS-IP/C</td>
<td>Resolution (center, peripheral, high level), MTF, SNR, power consumption, luminance gain, maximal output brightness</td>
<td>BM-IP/C base module, M-I microscope, VM-I video microscope, OS-1 stage, set of 3 holders for potted tubes, PC, frame grabber, TAS-IP/C computer program, ITS Display computer program, MC Viewer program, LP1 luminance probe</td>
</tr>
<tr>
<td>ITS-IP/D</td>
<td>Resolution (center, peripheral, high level), MTF, Blemishes (dark spots/fixed pattern noise), SNR, Output Brightness Uniformity, Halo, Useful cathode diameter, Image Alignment, Shear Distortion, Gross Distortion, Image inversion, Magnification, power consumption, luminance gain, maximal output brightness, EBI</td>
<td>BM-IP/D base module, M-I microscope, VM-I video microscope, DC-I camera, OS-1 stage, set of 3 holders for potted tubes, PC, frame grabber, TAS-IP/D computer program, ITS Display computer program, MC Viewer program, LP1 luminance probe, LP2 luminance probe</td>
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<tr>
<td>ITS-IP/E</td>
<td>Additionally luminous sensitivity</td>
<td>BM-IP/D base module converted to BM-IP/E version, additional CP current probe, HVP1 high voltage power supply, set of three bare tube holders</td>
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<tr>
<td>ITS-IP/F</td>
<td>Additionally radiometric sensitivity</td>
<td>BM-IP/E base module converted to BM-IP/F version</td>
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Version 3.4

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