pehmed

User Guide

Fluoro Phantom

User Guide:

Flouro Phantom

To reach us:

PEHA med. Geräte GmbH
Mühlstrasse 38
D-65843 Sulzbach- Germany
Tel: +49 6196 500 40 30
Fax: +49 6196 500 40 50
Internet: http://www.pehamed.de
e-mail: info@pehamed.de

The Pehamed Fluoro Phantom
User Guide

Application

The image quality produced by fluorographic X-ray apparatus will inevitably change over a period of time due to the aging of the component parts of the system. Sudden changes in image quality resultant from fault conditions may be quickly recognised by the user and corrective action taken. On the other hand, gradual deterioration of image quality can go undetected but will have a progressive and deleterious effect on the diagnostic capabilities of the apparatus. The Pehamed Fluoro-Phantom is an easy to use Q.A. test-tool designed to carry out regular subjective performance (constancy) testing of X-ray fluorographic imaging systems. The features incorporated into the phantom allows the user to assess the performance of the image intensifier/T.V. system in terms of its limiting resolution and low contrast threshold. The phantom is normally used to provide initial 'base line' measurements taken when the system is known to be working within its design specifications. Periodic measurements (e.g. every 2 months) are then taken and compared with the 'base line' values in order to determine whether the image quality has deteriorated to a point where corrective action is required.

Physical description

The phantom comprises an opalescent acrylic disk measuring 180 mm in diameter and 9mm thick. The position of all details within the phantom are clearly printed on the upper surface to allow the user to orient the phantom in the X-ray beam.

The features embedded within the phantom are illustrated in the diagram next page.

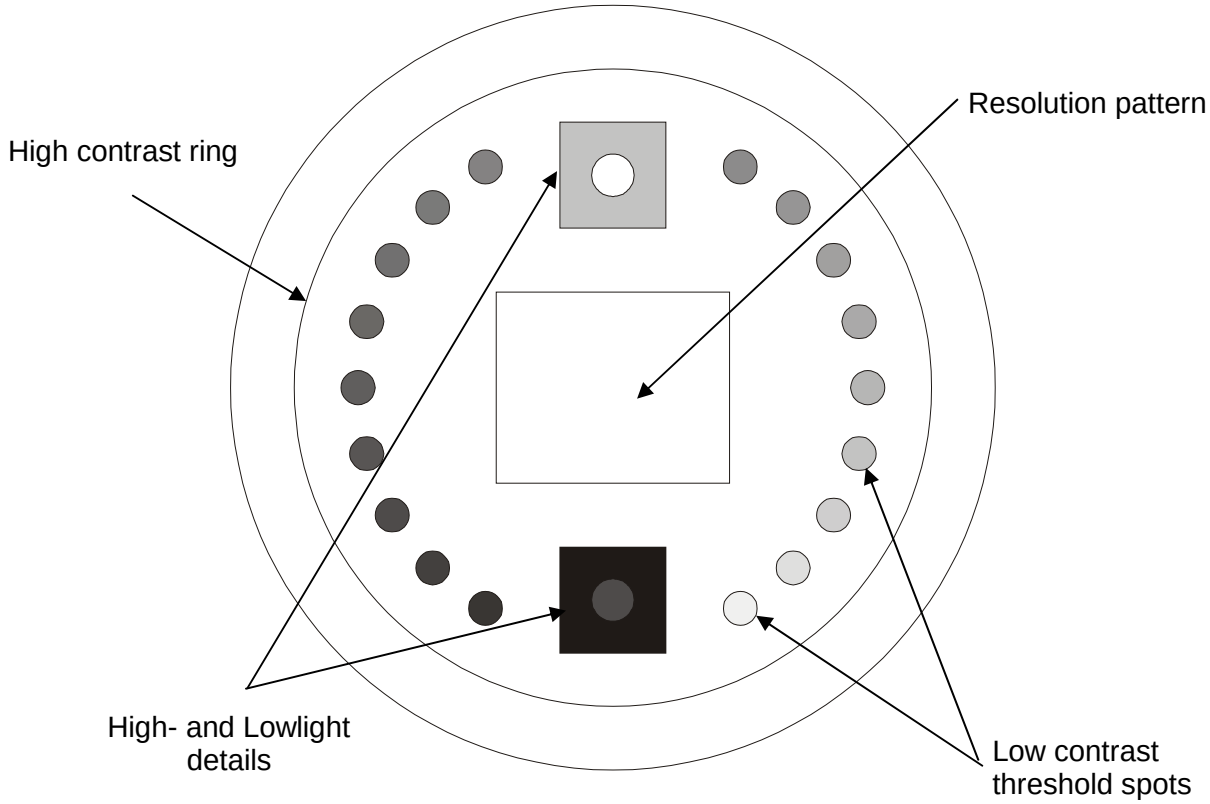

Diagram showing the features within the Fluoro Phantom

Summary of features

The **high and lowlight objects** are used to set up the display monitor brightness and contrast prior to carrying out the other image quality checks, where the contrast and brilliance controls are accessible to the user.

The **high contrast ring** is used to check the system for signs of geometric distortion.

The **Huttner line pair resolution pattern** is used to determine the limiting resolution of the system. The line pair pattern is incremented to measure spatial resolutions of between 0.5 and 5 line pairs per mm. It is manufactured from 100 um thickness of lead.

The **low contrast threshold spots** are used to determine the ability of the fluorography system to discriminate between adjacent areas of low radiographic contrast. A total of 18 density spots using attenuating materials of varying thickness have been incorporated into the phantom. These are arranged incrementally around the periphery of the phantom.

Method of use

The procedure for placing the phantom in the X-ray beam will differ according to the type of equipment under test e.g. overcouch or undercouch image intensifier, fixed or mobile equipment. In general terms the user should aim to establish a reproducible set of circumstances for the test by placing the phantom in the X-ray beam as close to the image intensifier face as conveniently possible and by using the same X-ray tube – image intensifier distance. Some systems may allow easy access to the face of the image intensifier while others may require the phantom to be placed on the surface of the examination couch. The most important thing is that wherever the phantom is placed this should allow the set up to be followed for all subsequent tests on that equipment.

While certain tests are carried out with only the phantom interposed in the X-ray beam other tests are best carried out in conjunction with a 'patient equivalent filter', e.g. a piece 1mm thick copper sheet 150 x 150mm, also placed in the X-ray beam before the phantom. Once again the preferred position of this will be determined by whether it is possible to gain access to the X-ray tube. If at all possible place the copper on the window of the X-ray tube beam collimator; failing that on the table top (see diagrams below). Details of when to or when not to interpose the filter material is described in the following passages.

- Place the phantom in the X-ray beam as illustrated in the diagrams above (but leave out the copper filter at this stage). Using a 70kV fluorography exposure, collimate the x-ray field to the size of the phantom and reduce the X-ray tube to image intensifier distance to its minimum adjustment.

- **Monitor adjustment**
  Adjust the monitor settings (if these adjustments are accessible to the user) using the high and low contrast objects within the phantom as a reference to obtain optimum brilliance and contrast levels. Both circles in the details should be visible

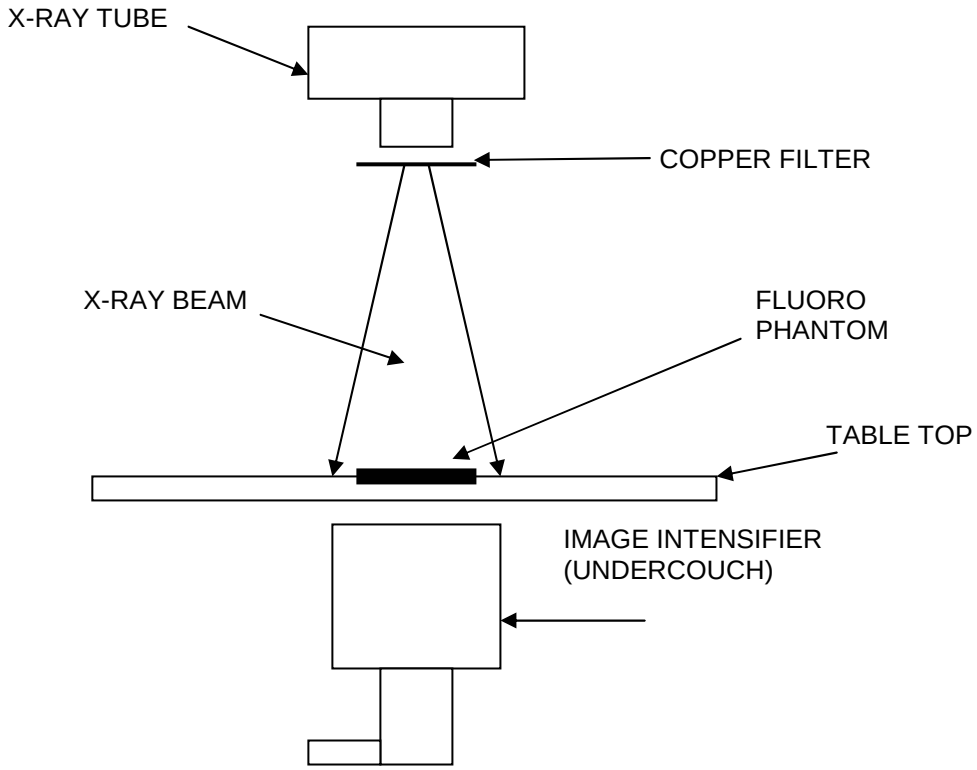

Diagram showing the typical placement of the Fluoro Phantom and copper filter in relation to the X-ray tube and undercouch image intensifier

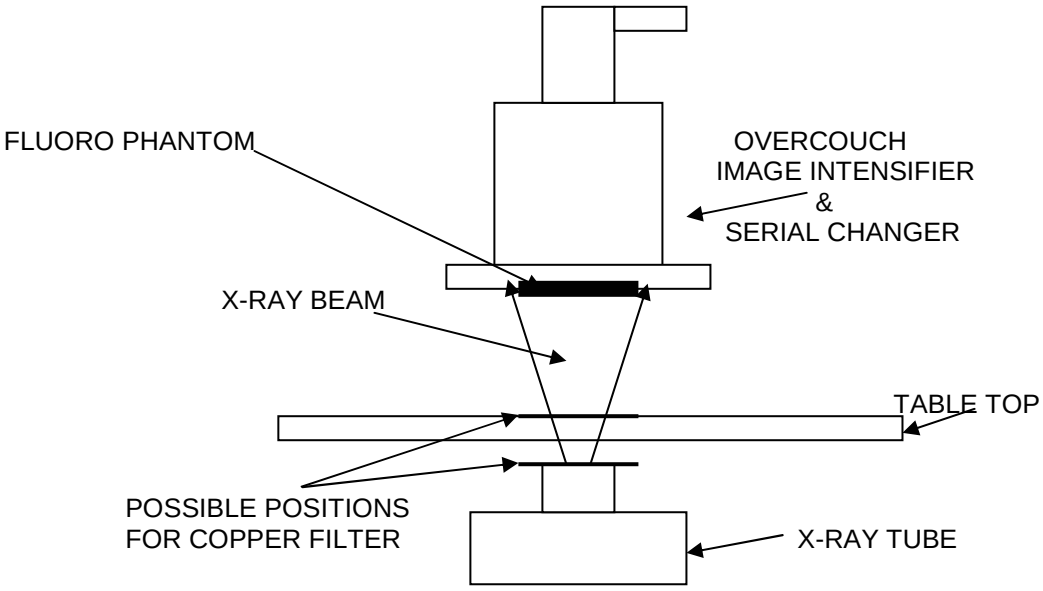

Diagram showing the typical placement of the Fluoro Phantom and copper filter in relation to the X-tay tube and overcouch image intensifier

- **Geometry of image**
  At this stage it is also appropriate to note whether the high contrast ring is reproduced as a perfect circle or whether the ring shows any signs of geometrical distortion. The symmetry of iris collimators can also be assessed by reference to the high contrast ring.

- **Resolution**
  Using the line pair resolution pattern note the maximum number of line pairs that can be resolved. This test should be repeated for all magnification fields.

  Position the copper in the X-ray beam and repeat the tests once again noting the maximum number of line pairs that can be resolved.

- **Low contrast objects**
  Place the copper filter in the beam according to the diagrams above. Count the maximum number from the total of 18 low contrast objects that can be seen and note this. Repeat the test for all magnification fields. The number of spots that can be seen will be influenced by the age and overall specification of the system. As a general guideline, most modern fluorographic systems should be able to resolve approximately 14 density spots.

Interpretation

A reduction of 2 line pair groups and/or 2 low contrast threshold spots from the ‘base line’ values would be regarded as significant and would warrant further investigation. Any significant change in the performance of the system should be reported to the Radiological Protection Advisor who will recommend corrective action as appropriate.