

# **Nuclear Associates 18-216, 18-216-1000**

**Single-Exposure High Contrast Resolution Phantom**

## **Operators Manual**

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## Section 1

# General Information

## 1.1 Objective

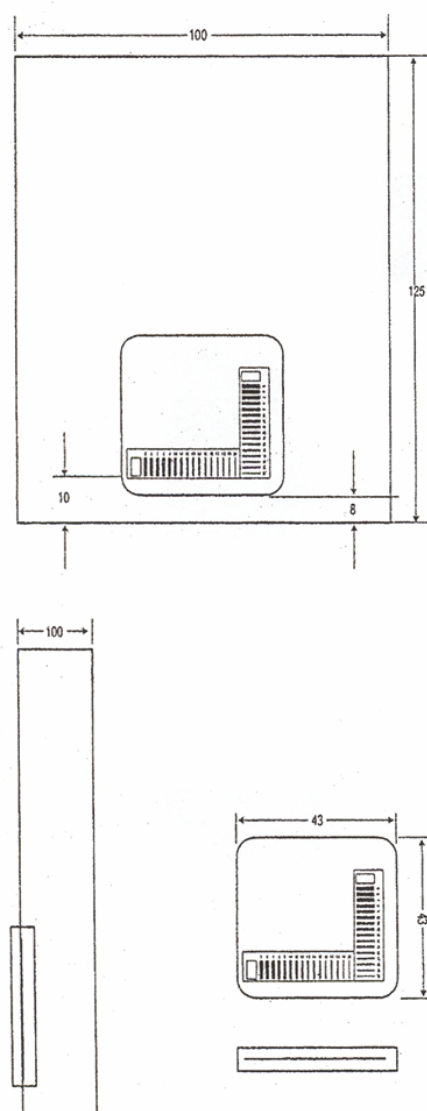
Focal spot performance may be evaluated by determining limiting resolution using a high-contrast resolution pattern providing a test up to 16 lp/mm and preferably 20 lp/mm (either a bar pattern, a star pattern, or a wedge pattern marked to identify the number of lp/mm in the image at the appropriate points).

## 1.2 Description Of Phantom

The Single-Exposure High Contrast Resolution Phantom incorporates two 17.5 micron thick gold-nickel alloy bar patterns positioned at 90 degrees. This allows assessment of resolution perpendicular and parallel to anode-cathode axis in just one exposure. Each pattern has 17 segments from 5 lp to 20 lp/mm and is equivalent to 25 microns of lead or 2.6 mm of aluminum at 20 keV.

The bar patterns are permanently embedded in a thin acrylic wafer to protect them from wear or damage.

The phantom body is available in BR12 (Model 18-216) or BR50/50 (Model 18-216-1000). It enables consistent, reproducible positioning of the bar pattern at 4.5 cm above the breast support plate and 1 cm from the chest wall, centered laterally (as recommended by the American College of Radiology). The bar pattern can also be positioned at a variety of heights for more thorough evaluations. The Single-Exposure High Contrast Resolution Phantom includes a 30X hand-held microscope.



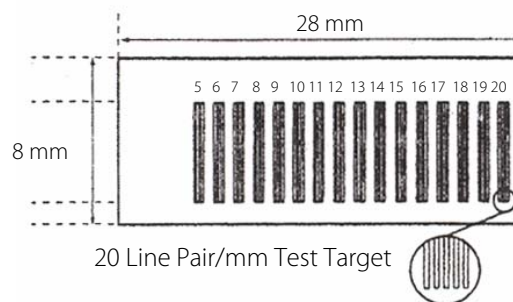
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## **Section 2**

# **Operation**

### **2.1 Use Of The Phantom\***

1. Place the pattern at the desired height above the breast support plate, either with no extraneous materials between the bar pattern and the breast support, or with a homogeneous phantom supporting the pattern. Position the pattern within 1 cm of the chest wall edge of the image receptor, centered laterally. It is important that the test pattern be positioned in a reproducible manner. A test stand or jig may be helpful.
2. Place the image receptor in the location where it would normally be used for mammography, (i.e., in the cassette holder for contact mammography.) If a stationary grid is normally used with the imaging system, remove it to avoid moire patterns.
3. Select the kVp, mA, and focal spot used for imaging an average breast during normal radiography and an exposure time that will produce a background optical density from 1.2 to 1.6. This may be done either manually or in the AEC mode.
4. Make an exposure and process the film.
5. Repeat steps 1 through 6 for other focal spots and other geometries. In magnification mode, the bar pattern should be positioned 4.5 cm above the magnification breast support. Be sure to record the magnification factor.



### **2.2 Data Interpretation And Analysis\***

1. Under masked conditions, view the high-contrast resolution pattern images with 10x to 30x magnification.
2. Note the highest frequency pattern with lines that are distinctly visible throughout at least half of the bar length (for a bar pattern) and record the highest frequency visible for each test image.

### **2.3 Suggested Performance Criteria And Corrective Action\***

In the contact mode, measurements made with the bars parallel to the anode-cathode axis should be at least 13 lp/mm; measurements with the bars perpendicular to the anode-cathode axis should be at least 11 lp/mm. In magnification mode, the limiting spatial resolution should be no lower than the above specifications.

If the above specifications are not met, remove the compression paddle and the grid and retest (while maintaining geometry consistent with that before). If the results are still below the above specifications, a more detailed investigation of the reason should be made using a slit camera.

For acceptance testing, it is recommended that both slit and high-contrast resolution pattern adjustments be made and compared. Then, for routine QC, high-contrast resolution pattern images can be obtained and compared with those images obtained during acceptance testing.

NOTE
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\*Excerpts taken from The American College of Radiology Mammography Quality Control Manual, 1994 Revised Edition, pages 145-146.



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