



Functional Resolution and Image Uniformity

Description and Reason For Testing

Functional resolution is an imaging system's ability to detect and display the size, shape, and depth of the non-echogenic target structures within the TM matrix of the test phantom. The targets should appear circular with sharp clearly defined edges, indicating an abrupt transition from the echogenic to the non-echogenic region. The targets are anechoic and should be free of any internal echoes or fill-in.

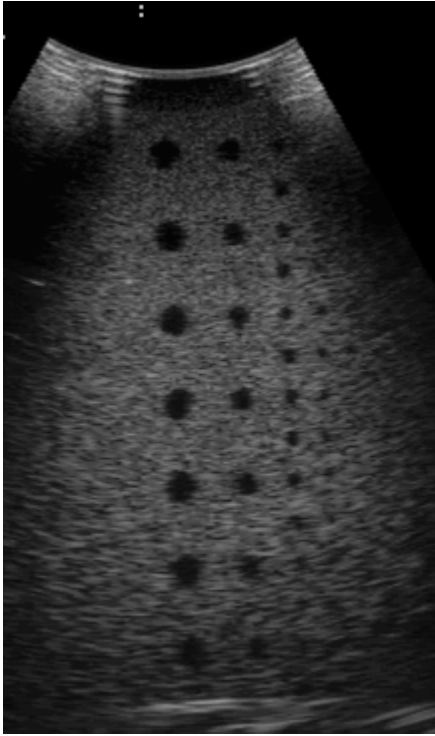
Bright artifacts may be observed at the top and bottom of the targets, these are normal specular reflections and do not present a problem. However, observable shade of gray within the anechoic target, usually is indicative of internal system noise and/or the presence of side lobes. Should the targets appear flattened, a geometric distortion problem should be considered. In practice, the data obtained will give a direct indication of the smallest diameter target the system is capable of resolving at a given depth. The functional resolution capabilities of a system can be affected by side lobes in the transducer beam, electrical noise, and problems in the imaging processing hardware.

Imaging these target structures can also provide information concerning image uniformity or homogeneity and identifying any areas of non-uniformity. These artifacts can be the result of transducer malfunction, poor electrical contacts, failure in the image processing and/or system's software, and poor acoustic coupling between the transducer/patient interface causing the

introduction of reverberations artifacts. Generally, horizontal bands are often caused by circuitry and focusing problems while vertical bands indicate a damaged transducer element.

Testing Procedure

1. Position the transducer over the anechoic target structures until a clear image is obtained.
2. Freeze image and obtain a hard copy.
3. Examine the image to determine the first and last target in each size group displayed. Record the range of depths visualized for each group. Due to the configuration of the sound beam small targets in the near field may not be imaged.
4. Scan this region to determine if there are any areas of non-uniformity. If the initial image demonstrates non-uniformity or artifacts of this type, repeat the scan at a different location using the same phantom to rule out a defect in a particular region of the phantom. If the artifacts are still present, note the gain settings, gray scale level and focal setting and document with a photograph. Repeat the scan using a different gain and focal setting.
5. Document all findings on the quality assurance record



Results

The system's functional resolution and image uniformity should remain consistent from week to week when using the same instrument settings and ATS Laboratories' phantom. Compare the test results obtained from the baseline records. If the current image demonstrates changes in the system's ability to resolve these targets, or major areas of image non-uniformity are observed, corrective action should be considered.

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