

Ultrasound Imaging Phantoms

www.atslaboratories-phantoms.com

Model 531

Gray Scale Phantom Instructions Manual

Revised January 2015

Made in USA

Introduction

Quality assurance tissue-mimicking phantoms are used to evaluate the accuracy and performance of ultrasound imaging systems. The phantoms mimic the acoustic properties of human tissue and provide test structures within the simulated environment. They are essential to detect the performance changes that occur through normal aging and deterioration of system components. Routine equipment performance monitoring can reduce the number of repeat examinations, the duration of examinations and maintenance time.

This phantom is constructed of a rubber-based tissue-mimicking material developed by ATS Laboratories. This material extends the useful life of the phantom by avoiding problems due to melting, freezing, dehydration and breakage from dropping which are common with hydrogel (water-based) phantoms. By eliminating these problems, the durability, quality and reliability of this product is guaranteed for three years.

The acoustic properties of all biologic and non-biologic materials are affected by temperature variations. Most diagnostic imaging systems and tissue-mimicking phantoms are calibrated at room temperature, commonly referred to as 23°C. To ensure measurement accuracy ATS incorporates a thermometer strip affixed to the outside surface of the phantom housing.

The sound velocity of most diagnostic imaging systems is calibrated to 1,540 meters per second (mps), the assumed average velocity of sound through human soft tissue. The rubber-based tissue-mimicking material has a sound velocity of 1450 mps at room temperature (23°C).

Product Description

The Model 531 Gray Scale/Displayed Dynamic Range phantom is composed of a rubber-based tissue mimicking material. The phantom is designed to evaluate an imaging system's gray scale processing and display dynamic range. It is provided with 10 levels of contrast relative to the background ranging from -15 to +15 dB.

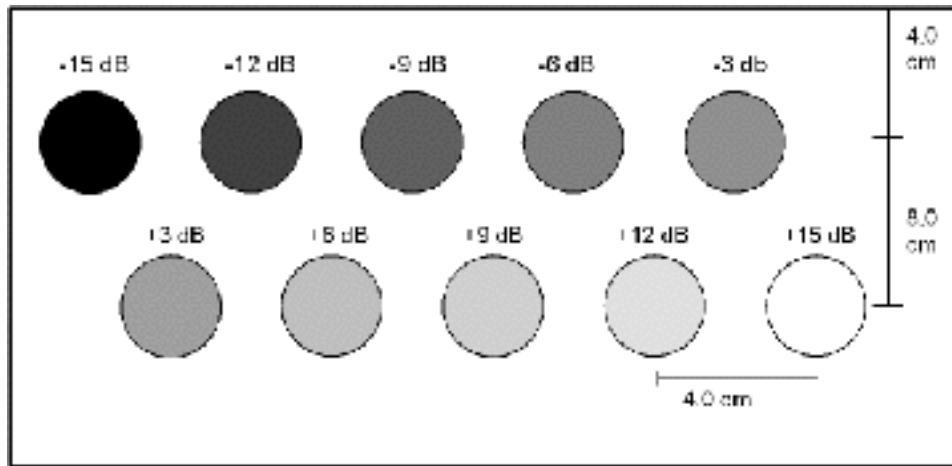
Tests Performed

Gray Scale

Displayed Dynamic Range

Specifications

General		Tissue Mimicking Material	
Overall dimensions	25 x 12 x 7 cm*	Type	Rubber-Based
Weight	2 Kg*	Freezing Point	< -40°C
Scan Surfaces	2	Melting Point	> 100°C
Scan Surface Dimensions	25 x 7 cm*	Background Attenuation	0.5 dB/cm/Mhz (measured at 3.5 MHz)
		Speed of Sound	1450 m/s at 23°C
Gray Scale Target Structures			
Type		Echogenic, Cylindrical	
Number of Targets		10	
Diameter		25 mm	
Interval Spacing (center to center)		40 mm ± 1 mm	
Depth		40 & 80 mm ± 1 mm	
Contrast relative to background material (dB)		+15, +12, +9, +6, +3, -3, -6, -9, -12, -15	
*Nominal dimensions			



Gray Scale & Displayed Dynamic Range

Description and Reason for Testing

Gray scale or gray scale processing uses the amplitude of the echoes received to vary the degree of brightness of the displayed image. The adjustment of the echo signal required to go from a just noticeable (low gray scale level) echo to the maximum echo brightness is referred to as the displayed dynamic range. Clinically, gray scale processing and displayed dynamic range allow echoes of varying degrees of amplitude to be displayed in the same image.

Test Procedure

1. Place the phantom on a clean, flat surface with the scan surface positioned for use.
2. Apply an adequate amount of low viscosity gel to the scan surface.
3. Adjust the instrument settings (TGC, output, etc) to establish baseline values for "normal" liver scanning. If the bottom of the phantom is seen, adjust the gain setting until the image goes entirely black. Record these settings on the quality assurance record. These settings should be used for subsequent testing.
4. Position the transducer over the gray scale target group until a clear image is obtained.
5. Freeze image and obtain a hard copy.
6. Examine the image. The targets should appear circular in shape, with clear sharp edges and vary in the degree of brightness ranging from low to high levels of contrast. The presence or absence of any shadowing behind the structures should be noted.
7. All findings should be documented on the quality assurance record.

Results

This target group varies in echogenicity and provides a good indication of the performance of the gray scale processing and displayed dynamic range. The test should be compared with a baseline test using the same instrument settings, to determine if any change in the characteristics of the target group has occurred with time. If changes are noted, they should be investigated.

Care of the Rubber-Based Phantoms

For best results the phantom should be kept clean at all times and stored at room temperature. In particular a build-up of dried coupling gel on the scan surface should be avoided. The phantom may be cleaned with warm water using a lint free cloth. Particularly stubborn stains and dirt may be removed with a mild household cleaner. The use of petroleum solvents should be avoided since they may adversely react with the rubber-based material.

Warranty

Statement of Warranty

ATS Laboratories, Incorporated warrants this rubber-based phantom for its lifetime from the date of delivery to the purchaser, that the Phantom is free from functional defects in materials and workmanship. The lifetime of this phantom is estimated to be 10 years from the date of manufacturing. If ATS Laboratories, Incorporated, deems the phantom to be defective, at its sole option, the Phantom will be repaired or replaced free of charge, in a reasonable amount of time.

ATS shall not be otherwise liable for any damages, including but not limited to incidental damages, consequential damages, or special damages.

There are no express or implied warranties which extend beyond the warranties as stated below.

Conditions of Warranty

1. The defect must be reported and the Phantom returned within the warranty period.
2. The Phantom must be packaged properly to avoid damage during shipping.
3. All transportation charges will be paid by the purchaser.

Invalidation of Warranty

1. If the phantom has been altered or repaired other than by ATS Laboratories, Incorporated.
2. If the phantom has been subject to abuse, misuse, negligence or accident.
3. If the purchaser has exposed the Phantom to petroleum solvents.