Neonatal Chest Phantom

1. Product Introduction & Structure

A.1. Phantom Introduction

The Neonatal Chest Phantom is specifically designed for daily quality assurance monitoring of computed radiography (CR) and digital radiography (DR) systems. Because the phantom replicates the anatomical structure and tissue attenuation characteristics of a real newborn, clinical protocols can be used to image the phantom, thereby testing the entire imaging chain, including image processing parameters.

The Neonatal Chest Phantom is the first anthropomorphic neonatal phantom whose transmission properties, histogram, physical dimensions, and structure adequately represent a 1–2 kg newborn. Consequently, it can be imaged using appropriate clinical parameters to provide a measurement of image consistency over time.

Figure A.1 Schematic diagram of the Neonatal Chest Phantom

The Neonatal Chest Phantom also contains clinically relevant image quality challenge solutions: simulated pneumothorax, pleural thickening (noise forms), and simulated hyaline membrane disease lung.

The Neonatal Chest Phantom meets the recognition of international and national standards organizations (such as IPEM and AAPM) for comprehensive quality assurance programs in CR and DR, addressing the two major issues of patient exposure and image quality. Patient exposure is a concern because CR and DR devices scale over- exposed images to an appropriate optical density. The resulting phenomenon, often termed "dose creep", is particularly relevant in pediatric imaging, where some patients undergo radiography multiple times per day.

Image quality assessment is complicated by the way CR and DR systems use prior knowledge of the anatomy being radiographed to process and display images. Image quality may be degraded by inappropriate parameter selection. The impact of parameter selection on image quality can only be evaluated using phantoms that replicate human anatomy.

The Neonatal Chest Phantom is especially suitable as a tool for ensuring the lowest possible exposure level while still maintaining diagnostic image quality.

Figure A.2 Cross- sectional view of the Neonatal Chest Phantom

Table A.1 Neonatal Chest Phantom Technical Specifications

Specification	Details
Dimensions	100 × 100 × 54 mm
Weight	500 g
Composition (tissue- equivalent materials)	Air, muscle, normal lung, hyaline membrane disease lung, bone
Included lung inserts	#1 – Hyaline membrane disease: with pneumothorax
	#2 – Hyaline membrane disease: without pneumothorax
	#3 – Normal texture: with pneumothorax
	#4 – Normal texture: without pneumothorax