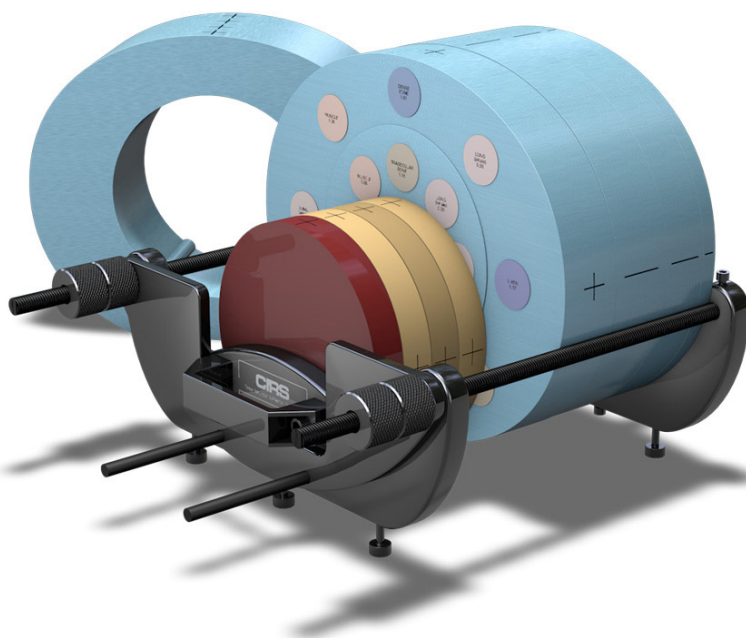


# CBCT Electron Density & Image Quality Phantom

Model 062MQA



## MINIMIZE DOSE • INCREASE IMAGE QUALITY • ENHANCE OUTCOMES

The Model 062MQA phantom provides a comprehensive tool that can be used for both electron density calibration and image quality assessment of Cone Beam CT systems integrated in radiation therapy devices. The electron calibration function of the phantom enhances the outcome of the adaptive radiation therapy while the image quality features address the fine balance between optimizing image quality while minimizing radiation dose.

The 062MQA CBCT Electron Density & Image Quality Phantom incorporates 3 phantoms:

1. Electron Density Phantom (50 mm thick)
2. CBCT Phantom which is used with the Electron Density Phantom
3. CBCT Image Quality Phantom

The 100 mm thick body section has a central hole that receives the CBCT Image Quality Phantom. Each Bolus slab is drilled to accommodate an ion chamber insert and allow for ion chamber measurements regardless of the position of the Image Quality Insert. The thicknesses of the sections were

selected to allow for positioning of any of the layers containing the Image Quality features in the central axis of the beam. Also sections of different thickness decrease the increment with which the electron density section can be offset from the central axis.

### Features

- Perform all CT Image QA tests for AAPM TG Report #1
- Perform dose measurements using Ionization chambers
- Calibrate Electron Density in multi-slice CT and Cone Beam CT
- Perform central axis and off-set measurements
- Position simulated tissue materials in CT & CBCT energy range at 17 different locations
- Optimized for volumetric imaging
- Quick positioning and customized loading configurations

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**CIRS**

Tissue Simulation & Phantom Technology

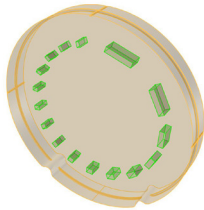
# The One Tool Electron Density Calibration &

## CBCT IMAGE QUALITY PHANTOM

The Phantom is comprised of four layers: spatial resolution, CT number linearity/slice thickness, low contrast and uniformity. The positioning of the different layers of the CBCT Image Quality phantom at the central axis can be done with the phantom in the 100mm body section or with the phantom placed directly on the support device.

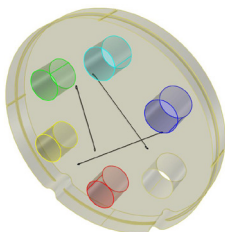
### SPATIAL RESOLUTION LAYER

The Spatial Resolution Layer is designed to evaluate the spatial resolution of IGRT systems. Line pair patterns from 1 lp/cm to 16 lp/cm are embedded in the background. In order to minimize artifacts, each line pair pattern is made from a material with 350HU greater than the background attenuation. The line pair patterns are 3D patterns 12mm in height along the longitudinal axis of the CBCT Image Quality Phantom. The spatial resolution targets are arranged in a circular pattern.



### CT NUMBER LINEARITY AND SLICE THICKNESS LAYER

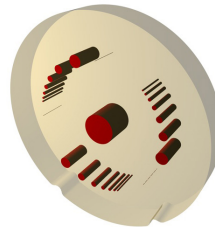
The CT Number Linearity and Slice Thickness Layer is designed to determine Contrast-to-Noise Ratio, Hounsfield number accuracy and Slice Thickness Sensitivity. Six rods made of Air, Low Density Polyethylene (LDPE), Polystyrene, Acrylic, Delrin and Teflon are used to measure the CNR and Hounsfield Number Accuracy. Three angled air channels arranged in an equilateral triangle can be used to assess Slice thickness sensitivity.



### LOW CONTRAST LAYER

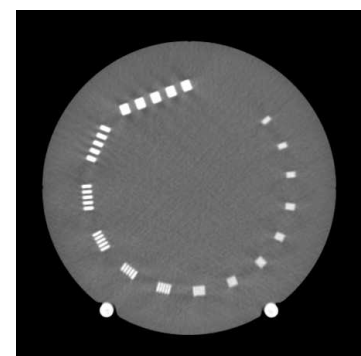
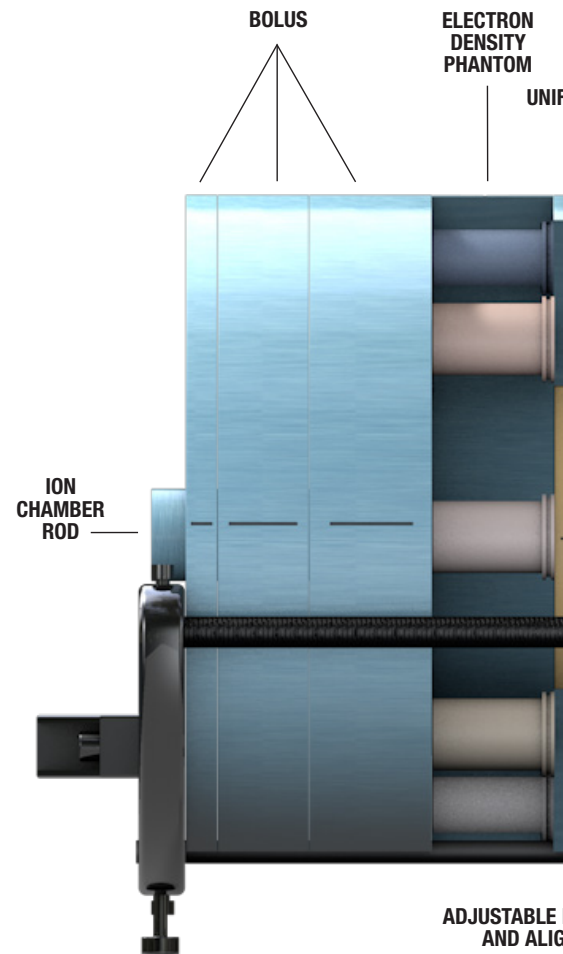
The Low Contrast Layer is intended to assess the system's ability to detect small differences in contrast. It contains three sets of low contrast rods with linear attenuation differences of 0.5%, 1% and 2% relative to the background material. The diameters of the low contrast rods were chosen to provide a 0.5 ratio between two adjacent rods by cross section and volume.

Additional features are designed to evaluate the magnification on the orthogonal axes of the transversal image and as input for calculation of the Point Spread Function and subsequent calculation of Modulation Transfer Function.

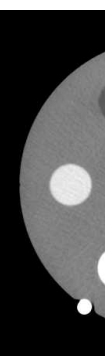


### UNIFORMITY LAYER

The Uniformity Layer is designed to measure the system's ability to produce uniform images across the field of view of an object with highly homogeneous physical properties in all directions.



SPATIAL RESOLUTION

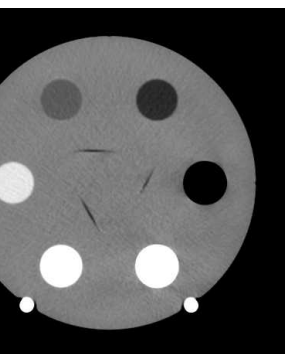
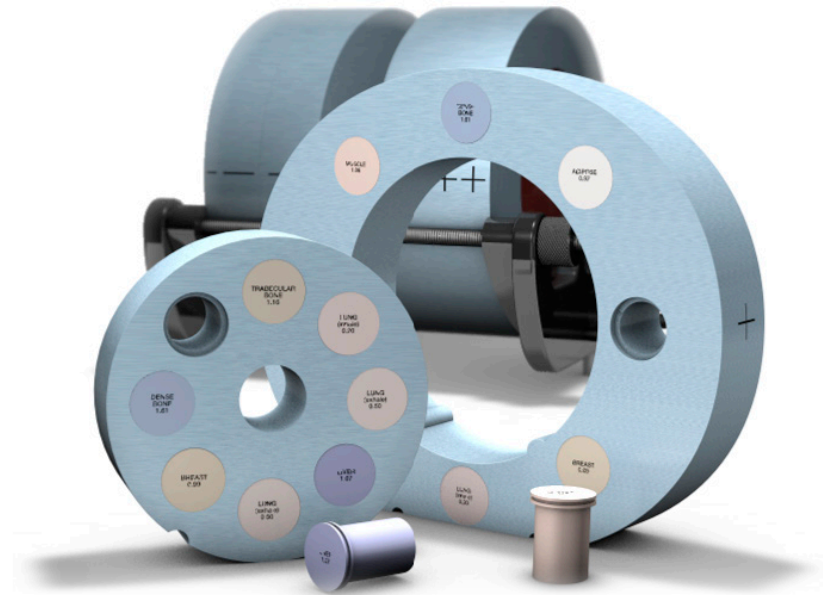
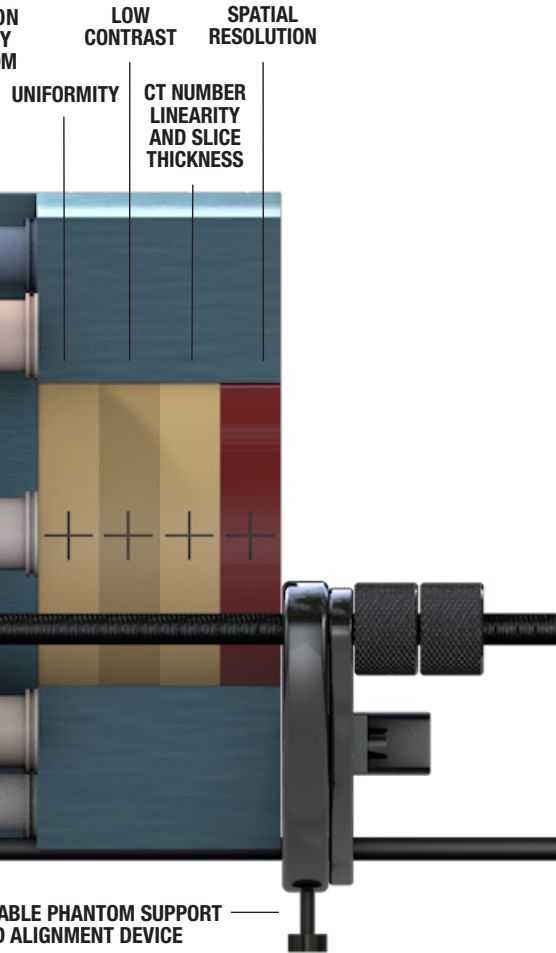


CT NUMBER LINEARITY AND SLICE THICKNESS

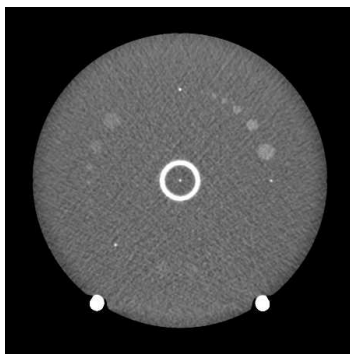
# Optimal Solution for & Image Quality Assessment

## ELECTRON DENSITY PHANTOM

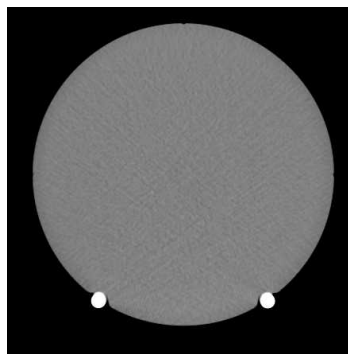
The Phantom consists of nested disks made from Plastic Water®. The nested disks allow simulation of both head and abdomen configurations. Eight different tissue equivalent inserts can be positioned at 17 different locations within the scan field. The geometry of the phantom also enables the user to take measurement offset from the central axis.



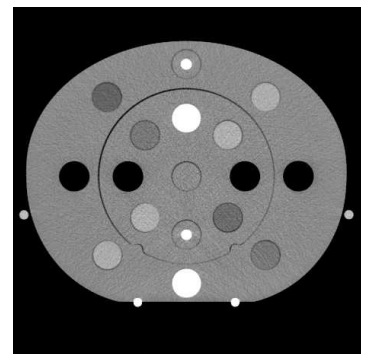
CT NUMBER LINEARITY AND SLICE THICKNESS



LOW CONTRAST



UNIFORMITY



ELECTRON DENSITY

## AND IMAGE QUALITY PHANTOM

## SPECIFICATIONS

<b>OVERALL DIMENSIONS:</b>	33 cm x 27 cm x 25 cm (W x H x D) (13" x 10.6" x 9.8")
<b>WEIGHT:</b>	≈ 20.5 kg (45.2 lb)

<b>MATERIALS:</b>	Water and Tissue Equivalent Epoxy Resins, Engineered Plastics
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### MODEL 062MQA INCLUDES

QTY	PART NO.	DESCRIPTION	PHYSICAL DENSITY, g/cc	ELECTRON DENSITY, x 10 <sup>23</sup> ELECTRONS/CC	RED (RELATIVE TO H <sub>2</sub> O)
1	062MA-01	Electron Density Head Insert	1.029	3.333	0.998
1	062MA-02	Electron Density Body without Head Insert	1.029	3.333	0.998
2	062A-04	Lung (Inhale) Equivalent Electron Density Plug	0.205	0.668	0.200
2	062A-05	Lung (Exhale) Equivalent Electron Density Plug	0.507	1.658	0.496
2	062A-06	Breast (50% Gland / 50% Adipose) Equivalent Electron Density Plug	0.99	3.261	0.976
2	062A-08	Solid Trabecular Bone (200 mg/cc HA) Equivalent Electron Density Plug	1.16	3.730	1.117
2	062A-09	Liver Equivalent Electron Density Plug	1.07	3.516	1.052
2	062A-10	Muscle Equivalent Electron Density Plug	1.06	3.483	1.043
2	062A-11	Adipose Equivalent Electron Density Plug	0.96	3.171	0.949
2	062A-15	Solid Dense Bone (800 mg/cc HA) Equivalent Electron Density Plug	1.53	4.862	1.456
1	062A-27	Solid Dense Bone (1250 mg/cc HA) Equivalent Electron Density Plug	1.82	5.663	1.695
1	062MA-39	Water-fillable Electron Density Plug, Ø 1" removable vial inside (Real water data provided)	1.00	3.340	1.000
1	062M-30	Set of 2 Feet for Model 062M			
1	062M-40	Soft Carry Case for Model 062M			
1	062MA-24	50 mm Thick Bolus Slab	1.029	3.333	0.998
2	062MA-32	100 mm L x Ø 30 mm Background Equivalent Plug	1.029	3.333	0.998
1	062MA-33	12.5 mm Thick Bolus Slab	1.029	3.333	0.998
1	062MA-34	37.5 mm Thick Bolus Slab	1.029	3.333	0.998
1	062MA-36	CBCT Electron Density Phantom -Annulus (100 mm Thick)	1.029	3.32	0.998
1	062MA-37	CBCT Electron Density Phantom - Annulus Solid Insert (100 mm Thick)	1.029	3.333	0.998
1	062MA-30	Holder/Support set for Model 062MA & 062MQA			
1	062MA-40	Soft Carry Case for Model 062MA			
1	062MQA-35	CBCT Image Quality Phantom			
		Background (Uniformity, Low Contrast/Magnification, CT Number/Slice Thickness layer)	1.029	3.32	0.998
		Background (Spatial Resolution layer)	1.12	3.66	1.100
1	062MQA-30	Holder for 062MQA-35 CBCT Image Quality Phantom (assembled)			
1	062MQA-40	Soft Carry Case for 062MQA-35 CBCT Image Phantom and 062MQA-30 Holder			
1		User Guide			
-		48 Month Warranty			

### INSERT OPTIONS

\*Customers are encouraged to complete their order with the purchase of the insert option listed below. Refer to separate CIRS cavity and plug code list for available chamber cavities. If the ion chamber cavity is not specified by customer, phantom is supplied with Part No. 062MA-14-CV50-1 that accommodates a Farmer type ion chamber. TLDs and Film available upon special request.

QTY	PART NO.	DESCRIPTION	PHYSICAL DENSITY, g/cc	ELECTRON DENSITY, x 10 <sup>23</sup> electrons/cc	RED (RELATIVE TO H <sub>2</sub> O)
1	062MA-14-CV <sup>†</sup>	Water Equivalent Chamber Rod with Cavity for Ion Chamber	1.029	3.333	0.998
1	062MA-42	Water Equivalent Material Surrounding 6.4mm Diameter Aluminum Rod Core Electron Density Plug	2.70	8.008	2.398

