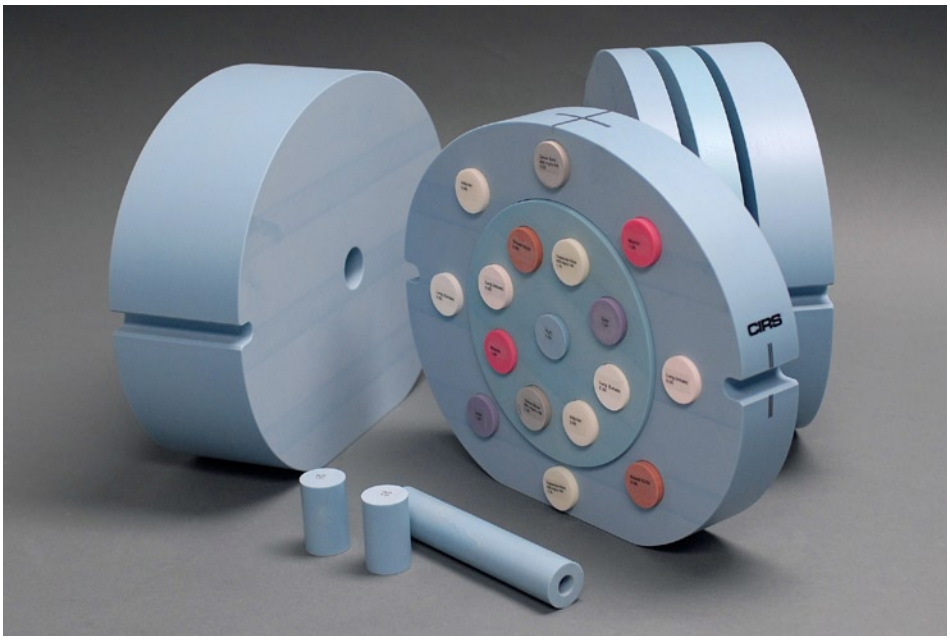
CBCT Electron Density Phantom

Model 062A



INCREASE CONFIDENCE IN HU VALUES FOR USE IN ADAPTIVE RADIATION THERAPY

The Cone beam (CBCT) Electron Density Phantom is an extended version of the CIRS Model 062A Electron Density Phantom and specifically designed for Cone Beam CT Imaging systems. Preliminary data shows that there may be differences between the HU readings for Diagnostic CT and Cone Beam CT. The geometry of the Cone Beam CT requires additional material and suggests that off central axis measurements should be taken.

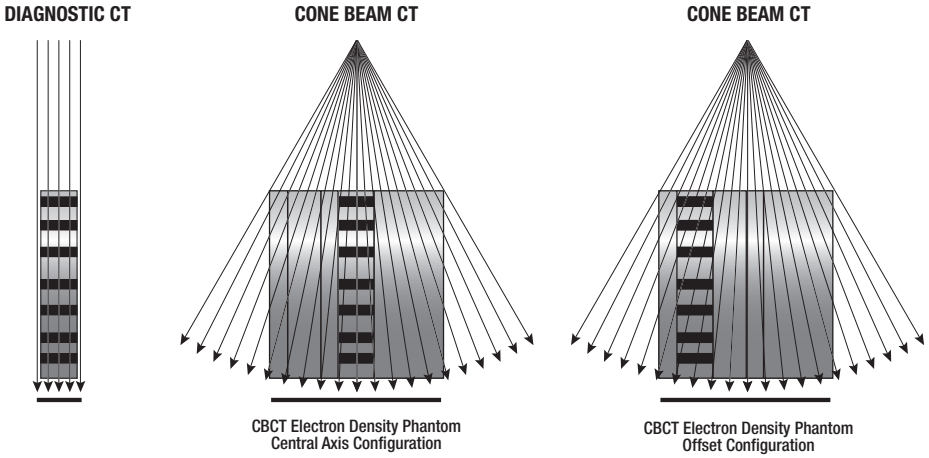
The phantom was designed in collaboration with Dr. Peter Cossmann[1], PhD to provide a reliable tool for CT number to electron density calibration in volumetric imaging. Reliable CT calibration curves help enable treatment plan adaptation directly from Cone Beam CT data. Additionally, the phantom accommodates any ion chamber for dose measurements and validation of heterogeneity correction based on the corrected CT calibration curve.

The Model 062A OBI Electron Density Phantom measures 33 cm W x 27 cm H x 25 cm L and therefore covers geometries for imager dimensions of up to 40 cm x 40 cm. It is made of Plastic Water®. The phantom contains the same set of tissue equivalent electron density inserts as the standard Model 062 and has additional interchangeable slabs allowing for repositioning of electron density section with an increment of 2.5 cm.

Features

- Can be used for multi-slice CT and Cone Beam CT
- Can be configured for central axis and off-set measurements
- Manufactured from durable epoxy
- Tissue equivalent inserts can be positioned at 17 different locations
- Special marker inserts enable quick assessment of distance registration
- All materials accurately simulate indicated tissue within CT and Cone beam CT energy range

CIRS



A large number of HU readings can be obtained by placing the electron density plugs in different positions both in central axis and offset configurations. Using an equation of the curve fitting for the collected values a CBCT to electron density calibration curve can be calculated.

SPECIFICATIONS

Overall Dimensions:	25 cm X 33 cm X 27 cm
Weight:	40 lbs
MATERIALS	
Phantom Body:	Plastic Water - DT
Inserts	CIRS Tissue Equivalent Materials (epoxy resin based)

PHANTOM INCLUDES

1	Solid Slab - 10 cm thick
1	Body Section - 5 cm thick with (8) locations for TE inserts
1	Head Section - 5 cm thick placed centrally in the body section with (9) locations for TE insertss
2	Solid Slab - 2.5 cm thick
1	Solid Slab - 5 cm thick
16	Tissue Equivalent (TE) insert 030mm x 5cm long (two of each) Lung (Inhale), Lung (Exhale), Adipose, Breast 50/50, Muscle, Liver, Bone 200 mg/cc HA, Bone 800 mg/cc
1	60cc syringe for water benchmark
1	Distance Marker Insert
2	Filler Rod for 10 cm slab
2	Connecting Rods with knobs - 30 cm long

OPTIONAL ACCESSORIES

1	Rod Ø30mm x 160mm length, to accommodate Ion Chamber

TISSUE EQUIVALENT MATERIALS

Description	Physical Density	Electron Density Per cc x 10^{23}	RED (Relative to H_2O)
Phantom Head (Center Section	1.01	3.346	1.002
Phantom Body (Outer Ring)	1.01	3.346	1.002
H2O Syringe	1.00	3.340	1.000
Lung (inhale)	0.20	3.340	0.190
Lung (exhale)	0.50	1.632	0.489
Breast (50/50)	0.99	3.261	0.976
Dense Bone 800mg/cc	1.53	4.862	1.456
Trabecuar Bone 200mg/cc	1.16	3.730	1.117
Liver	1.07	3.516	1.052
Muscle	1.06	3.483	1.043
Adipose	0.96	3.170	0.949
Distance Marker	1.01		

All materials accurately simulate indicated tissue within CT and Cone beam CT energy range

1. P Cossmann*, A Stuessi, C von Briel, Characterisation of a Linac Cone-Beam-CT Option: What Is the Future Potential for Treatment Planning? SU-GG-T-536, Medical Physics, Vol. 35, No. 6, June 2008

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