

MRI-LINAC Dynamic Phantom

Model 008M

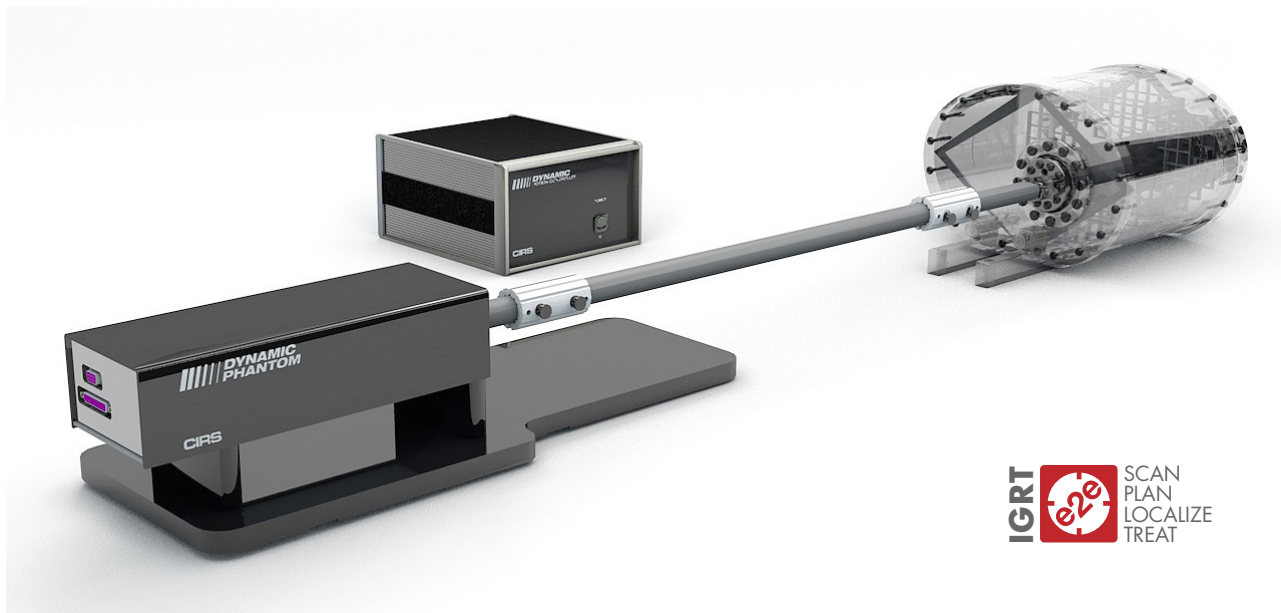


IMAGE ACQUISITION • TREATMENT PLANNING • DOSE DELIVERY

The CIRS MRI-LINAC Dynamic Phantom is designed for end-to-end commissioning, machine QA for hybrid MRI-LINAC Radiation Therapy systems, and verification of gated and adaptive treatment plans.

The Model 008M provides a means to assess MRI image quality, and to test tumor localization and motion-capturing devices. The phantom can be used to acquire moving or static target images for treatment planning and verification of gated or adaptive treatment delivery.

The phantom body, moving rod with target and extended rigid shaft connection are MRI-safe with 1.5T magnets. Motors and motion controller electronics are located at a safe distance from the magnet to ensure MRI image quality. The MRI-LINAC Dynamic Phantom utilizes CIRS Motion Control Software to provide precise, repeatable 3D target motion.

The phantom body approximates an average human body in size and shape. It is comprised of a plastic shell with a cylindrical thru hole to accommodate a moving rod with simulated target. The shell is filled with proprietary MRI signal-generating gel that allows for quick and easy phantom set-up without liquid motion artifacts. The phantom body is suspended on non-magnetic rails that allow for coil positioning and phantom registration to the couch.

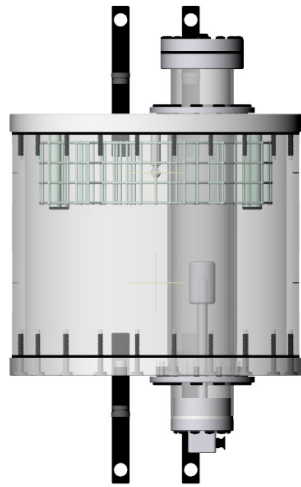
Model 008M contains MRI QA targets that are compatible with ACR accreditation program recommendations for:

- MRI image spatial distortion
- MRI field homogeneity
- Laser to ISO center coincidence

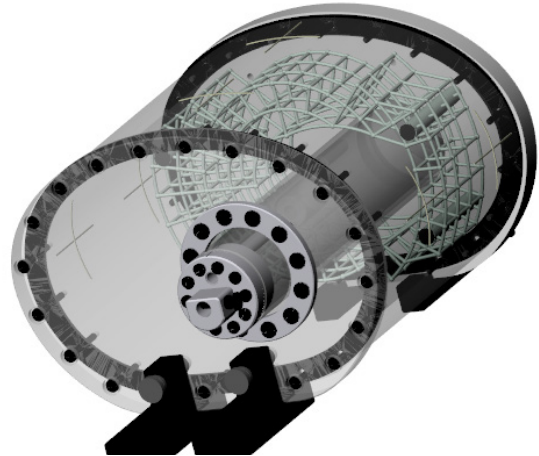
The moving insert with simulated target is a sealed, cylindrical rod filled with the same MRI signal-generating proprietary gel as the phantom body. The embedded MRI/CT target is made of MRI gel that provides contrast with respect to the background. This target can receive an ion chamber or other MRI-compatible dosimeters for treatment dose verification. There are laser marks machined on the outside of MRI shell body for both the MRI/CT target and MRI Distortion Grid. To facilitate MRI/CT Image fusion, there is a central fiducial aligned with the exterior laser marks, and in a known position with respect to 3D spatial distortion grid.

Features

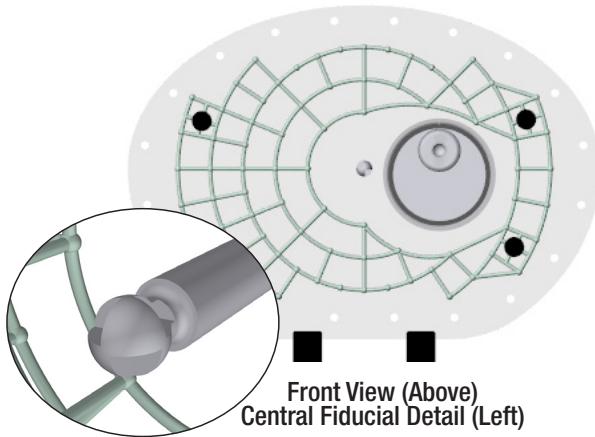
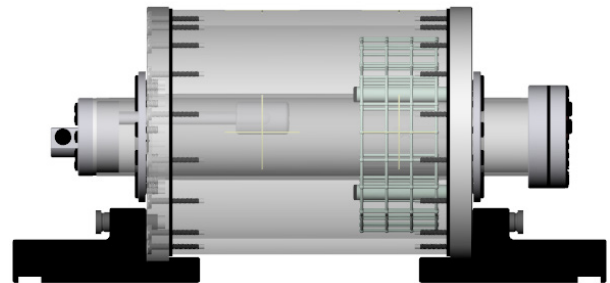
- MRI-CT-LINAC Compatible
- 3D target motion
- Gated and adaptive RT plan verification
- End-to-end commissioning
- MRI QA



Top View



Perspective View

Front View (Above)
Central Fiducial Detail (Left)

Side View

SPECIFICATIONS

MOTION CONTROLLER

| | |
|-----------------------|--|
| OVERALL DIMENSIONS: | 67 cm x 32 cm x 20 cm |
| OVERALL WEIGHT: | 10 kg (22 lb) |
| AMPLITUDE, IS: | ± 25 mm |
| AMPLITUDE, AP/LR: | ± 10 mm |
| AMPLITUDE, SURROGATE: | ± 25 mm |
| MOTION ACCURACY: | ± 0.1 mm |
| CYCLE TIME: | 1 - ∞ (adjusted based on amplitude) |
| WAVEFORMS: | $\sin(t)$, $1-2\cos^4(t)$, $1-2\cos^6(t)$, sawtooth, sharkfin |

PHANTOM BODY

| | |
|---------------------|-------------------------|
| OVERALL DIMENSIONS: | 25.6 cm x 32 cm x 20 cm |
| OVERALL WEIGHT: | 17 kg (38 lb) |

MOVING ROD

| | |
|---------------------|-------------------------------|
| OVERALL DIMENSIONS: | 32.7 cm x \varnothing 6.3 m |
| OVERALL WEIGHT: | 1.5 kg |

USER FRIENDLY MOTION CONTROL

The CIRS MRI-LINAC Dynamic Phantom target motion is independently controlled using CIRS Motion Control Software. The graphical user interface provides an unlimited variety of motions while simplifying the operation of Model 008M to an intuitive level. Patient specific motion profiles are easily imported and there is no need to make hardware adjustments or have special programming skills.



This phantom has been tested and certified for safe use in:

- Static magnetic field of 1.5 Tesla and 3 Tesla, **with**
- Maximum spatial field gradient of 0.24 T/m **and less**