

Multi-Lesion Brain QA Phantom

Model 037



USER GUIDE

CIRS

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OVERVIEW

The Multi-Lesion Brain QA Phantom for SRS, Model 037, provides an efficient method for comprehensive QA of single-isocenter, multi-lesion SRS treatment plans using radiochromic film in multiple locations. Unlike diode or ion chamber array devices, this method provides the high spatial resolution needed to fully evaluate the quality of SRS deliveries for every lesion at a single dose delivery. The size and composition of the Model 037 phantom result in QA dose distributions that closely mimic the actual dose distributions in patient plans. The high spatial resolution and true dose distributions provide QA analysis that is superior to other currently available techniques.

The phantom features 4 mounting rods of different materials optimized for kV image based setups and thus may be used to perform complete end-to-end testing for validation of single-isocenter multi-lesion techniques on different systems. The phantom may also be used to efficiently perform patient specific QA on a routine basis. Once a workflow is established, the time required for per patient setup and delivery is comparable to that of other common patient specific QA procedures.

With its precisely machined geometry, the Multi-Lesion phantom receives film in up to 29 planes with consecutive film planes centered precisely 5 mm apart. This empowers the user to acquire film measurements through high dose regions of each PTV in a multi-lesion plan with a single delivery. The pre-loaded polyester sheets exhibit the same thickness as radiochromic film, preserving the sensitive geometry required for this procedure. This allows to optimize film use by replacing the polyester sheets only where required. External laser marks provide the means for precise and repeatable phantom positioning on the treatment table. The ceramic BB positioned at the phantom's ISO center (split between two spacers) helps locating treatment plan with minimal efforts or shifting if needed. External grooves that are visible on TPS screen allow for convenient film loading and marking for easy and accurate film for treatment plan registration.

HANDLING AND CARE

It is recommended that the phantom only be cleaned with mild detergent and water.

SPECIFICATIONS

DIMENSIONS

150 mm (W) X 190 mm (H) x 170 cm (L)
Weight: 5 kg/ 11 lbs

MATERIALS

Brain Equivalent Epoxy Resin

SLAB THICKNESS

Top & Bottom slabs: 15 mm
Spacers: 4.7 mm

FILM DIMENSIONS

167 mm x 150 mm

POLYESTER SHEETS (PET)

29 pcs, 0.3 mm thick

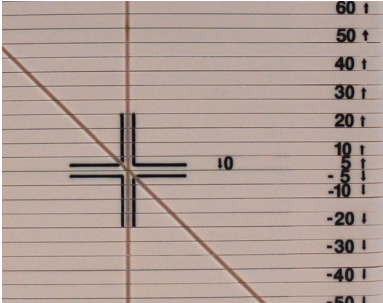
ACCESSORIES

Sample Precision Cut EBT3 Film Kit
60-Month Warranty
User Guide
Case



PHANTOM FEATURES

1. Phantom slabs (spacers) are 4.7 mm thick to accommodate radiochromic film or replacement polyester sheets with a thickness of 0.3 mm each. This allows consistent 5.0 mm spacing between films.
2. The ISO center of the phantom is located at the central film plane and is easy to identify by a ceramic BB that is split between corresponding slabs.
3. The external laser marks match with the ISO center and BB location.



4. Slabs are marked on two surfaces with a distance between pointed film plane to the central film in mm.
5. All slabs are precisely assembled together using 4 pin holes.



6. Mounting rods must be used to quickly and easily secure phantom assembly using locations that are labeled on the top of phantom surface. This ensures phantom integrity while using x-ray imaging for setup.



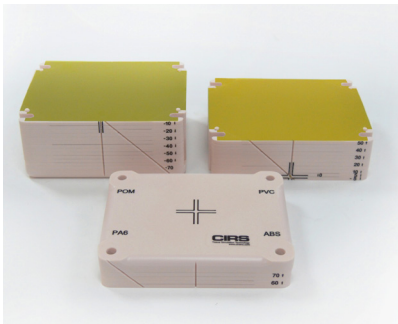
ID	MATERIAL	DENSITY
ABS	ABS	1.05 g/cc
PA6	Nylon	1.14 g/cc
POM	Delrin	1.41 g/cc
PVC	PVC	1.42 g/cc

PHANTOM FEATURES (CONT)

7. There are grooves on the external surfaces of the phantom. They are visible on the TPS screen and help to identify proper film positions for optimized QA. The grooves can also be used for film marking using permanent marker for precise film to treatment plan registration during QA analysis. Vertical grooves in the middle identify the film center, offset grooves prevent mispositioning and a diagonal groove at the 45° angle helps to identify desired film plane in respect to the central plane by simply measuring the distance between diagonal and vertical grooves that match to the distance from the central plane.

USE OF THE PHANTOM

CREATING A "QA PATIENT"



1. To create a "QA Patient" acquire a computed tomography (CT) image of the phantom. This may be done using your normal kV and mAs CT acquisition settings for your SRS brain protocol, as the size and composition of the phantom are comparable. It is advisable to use a slice thickness and spacing of 0.5 or 1 mm to correspond precisely with the geometry of the phantom. Image and store your phantom with all 29 polyester sheets in the phantom. Each polyester sheet is 0.3 mm thick. Small variations in geometry due to variable numbers of loaded sheets/films would complicate the QA procedure and have dramatic effects on the QA results. Ensure that the phantom is leveled and orientated as you will use it for QA measurements.
2. Prior to removing the phantom from the CT table, import the CT image into your treatment planning system (TPS) according to the procedure specified by the TPS vendor. Check that the film planes are precisely centered in CT slices. If they are not, fine tune the CT table height and acquire and import a new CT image into your TPS.
3. Create any necessary body and/or table structures.
4. It will be helpful to set an origin at the central slice of the phantom, that holds a ceramic BB, and create reference points corresponding to the locations of each of the film planes. These points should be set with high accuracy, and doing this properly in a QA phantom will greatly improve the efficiency of the routine QA procedure. Verify accuracy of the film plane reference point placements by comparing physical measurements of the grooves on the phantom with measurements made in the TPS.

SETTING UP A WORKFLOW

- It will be helpful to set up a spreadsheet to assist in efficiently locating appropriate film planes for each planning target volume (PTV). This process will vary, depending on how image origins and treatment isocenters are set during the planning process.

(A) If the normal practice for patient planning is to set both the image origin and treatment isocenter approximately at the center of the patient's brain, then the coordinates of the PTVs in the patient's plan will match the coordinates of the PTV dose distributions in the "QA Patient".

(B) If the normal practice for patient planning is to have a shift from the image origin to the isocenter, then it will be necessary to calculate PTV coordinates in the QA plan. The following is an example of a spreadsheet created to perform these calculations. The physicist performing the QA procedure would record the isocenter shifts for the patient plan, and the spreadsheet computes the corresponding coordinates and Plane #'s for the QA plan. This spreadsheet includes space for the physicist to denote the location in the plan. This can be helpful in identifying individual PTV dose distributions in the case when there are multiple high dose PTV regions in a single film plan.

Patient Name:									
Patient Plan	x	y	z						
Isocenter Shifts									
	PTV Center in Plan			PTV Center in QA plan			PTV	PTV	
	X	Y	Z	X	Y	Z	Plane #	Loc in Plane	
PTV1				0	0	0			
PTV2				0	0	0			
PTV3				0	0	0			
PTV4				0	0	0			
PTV5				0	0	0			
PTV6				0	0	0			
PTV7				0	0	0			
PTV8				0	0	0			
PTV9				0	0	0			
PTV10				0	0	0			

Note: It will be helpful to adopt a clinical practice of setting the patient treatment isocenter at the approximate center of the patient's brain, rather than at the center of the PTVs. If this is not practical or possible, it will be necessary to factor the appropriate shifts into your spreadsheet.

- Prepare film to use for patient QA procedures. Any radiochromic film suitable for SRS measurements will work, though it must be cut to fit the phantom. Precision Cut EBT3 Film kits are available for purchase to reduce effort and film waste: Part No. 158200-17-15 (Set of 15) and Part No. 158200-07-30 (Set of 30). Both kits include 6 calibration strips of the same orientation.

3. If not already implemented, set up an appropriate radiochromic film protocol according to instructions provided by your film and software vendor(s).

PERFORMING PATIENT QA

1. Compute a QA plan using your "QA Patient". Utilize the same gantry, couch and collimator angles as used in the patient plan.
2. Review the QA plan to ensure that the high dose PTV regions are all within the phantom. Perform shifts and re-calculate your QA plan if necessary.
3. Review QA plan to ensure that none of your PTV dose distributions intersect film planes only high dose gradient regions. This may occur if you plan to very small PTVs. If it does occur, add a small shift, re-calculate your QA plan and make a note to perform this shift prior to the QA delivery.
4. Identify PTV coordinates and Plane #'s in the QA plan for each PTV, according to the workflow set up in the previous section.
5. Remove polyester sheets from appropriate film planes, and replace with pre-cut films. Use grooves on the phantom edges for convenience. Keep films at the same orientation. Mark film orientation, as appropriate. Carefully mark edges of each film using phantom grooves for film to treatment plan registration during QA analysis.
6. Deliver the plan to the phantom. A good setup is critical. It is possible to achieve excellent QA results following a careful setup based only on crosshairs for machines with highly tuned crosshair and table parameters. The phantom also contains rods of various materials, which will enable an imaging based setup. While not necessary, image based setup corrections per couch angle provide the most accuracy in the QA process.
7. Remove and mark films. Analyze according to instructions provided by the film and film software vendor(s).

WARRANTY

All standard CIRS products and accessories are warranted by CIRS against defects in material and workmanship for a period as specified below. During the warranty period, the manufacturer will repair or, at its option, replace, at no charge, a product containing such defect provided it is returned, transportation prepaid, to the manufacturer. Products repaired in warranty will be returned transportation prepaid.

There are no warranties, expressed or implied, including without limitation any implied warranty of merchantability or fitness, which extend beyond the description on the face hereof. This expressed warranty excludes coverage of, and does not provide relief for, incidental or consequential damages of any kind or nature, including but not limited to loss of use, loss of sales or inconvenience. The exclusive remedy of the purchaser is limited to repair, recalibration, or replacement of the product at manufacturer's option.

This warranty does not apply if the product, as determined by the manufacturer, is defective because of normal wear, accident, misuse, or modification.

NON-WARRANTY SERVICE

If repairs or replacement not covered by this warranty are required, a repair estimate will be submitted for approval before proceeding with said repair or replacement.

RETURNS

If you are not satisfied with your purchase for any reason, please contact your local distributor prior to returning the product. Visit <https://www.cirsinc.com/distributors/> to find your local distributor. If you purchased your product direct through CIRS, call Customer Service at 800-617-1177, email rma@cirsinc.com, or fax an RMA request form to 757-857-0523. CIRS staff will attempt to remedy the issue via phone or email as soon as possible. If unable to correct the problem, a return material authorization (RMA) number will be issued. Non-standard or "customized" products may not be returned for refund or exchange unless such product is deemed by CIRS not to comply with documented order specifications. You must return the product to CIRS within 30 calendar days of the issuance of the RMA. All returns should be packed in the original cases and or packaging and must include any accessories, manuals and documentation that shipped with the product. The RMA number must be clearly indicated on the outside of each returned package. CIRS recommends that you use a carrier that offers shipment tracking for all returns and insure the full value of your package so that you are completely protected if the shipment is lost or damaged in transit. If you choose not to use a carrier that offers tracking or insure the product, you will be responsible for any loss or damage to the product during shipping. CIRS will not be responsible for lost or damaged return shipments. Return freight and insurance is to be pre-paid.

WITH RMA NUMBER, ITEMS MAY BE RETURNED TO:

CIRS
Receiving
900 Asbury Ave,
Norfolk, Virginia, 23513 USA

PRODUCT	WARRANTY PERIOD
Model 037 - Multi-Lesion Brain QA Phantom	60 Months



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