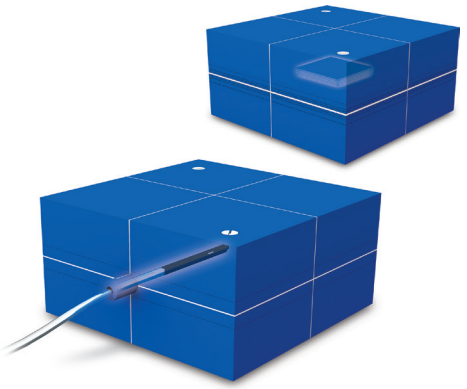


STEREOTACTIC DOSE VERIFICATION PHANTOM

REF 91250

STANDARD IMAGING, INC.
3120 Deming Way
Middleton, WI 53562-1461

TEL 800.261.4446
TEL 608.831.0025
FAX 608.831.2202

DOC #80527-04

STANDARD IMAGING

General Precautions

WARNING:
Follow manufacturer's recommended safety procedures for radioactive sources.

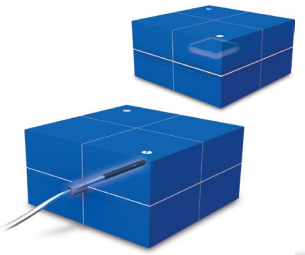
CAUTION:
Do not drop or mishandle the slabs.

CAUTION:
Refer all servicing to qualified individuals.

CAUTION:
Proper use of this device depends on careful reading of all instructions and labels.

Warnings and Cautions alert users to dangerous conditions that can occur if instructions in the manual are not obeyed. Warnings are conditions that can cause injury to the operator, while Cautions can cause damage to the equipment.

Table of Contents



STANDARD IMAGING®

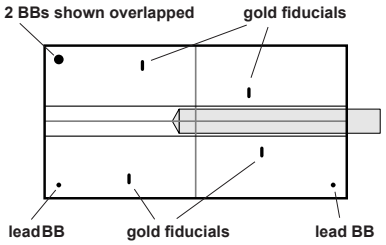
3120 DEMING WAY
MIDDLETON, WI 53562-1461 USA
WWW.STANDARDIMAGING.COM

Overview

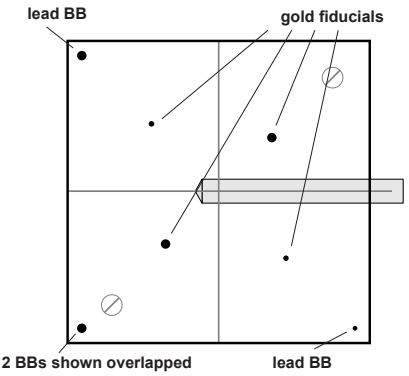
The Stereotactic Dose Verification Phantom can be used for a wide variety of tests including routine absolute dosimetry output checks and treatment planning system(TPS) commissioning and quality assurance(QA) tests as recommended by TG 53 and IEC 430 Treatment Planning System Commissioning and QA Standards. Patient specific dosimetry tests can be performed easily as well. The fixed portion of the phantom consists of the top and bottom 4 cm slabs that contain:

- **Gold fiducials** for positioning setup accuracy,
- **Lead BBs** diameter 1 mm at known precision manufactured locations on three corners so that superior – inferior, left – right, anterior – posterior and diagonal geometric distances can be confirmed in the imported patient CT studies thus demonstrating that no distortion is evident.

The bottom slab has two rigid alignment posts that ensure all phantom configurations are precisely and reproducibly aligned, for every insert used with the phantom. Additional large Blue Water blocks are available so that the 20 x 20 x 10 cm dimension can be increased to a 30 x 20 x 20 cm.



Front View



Top View (larger marks indicate marker located in top slab)

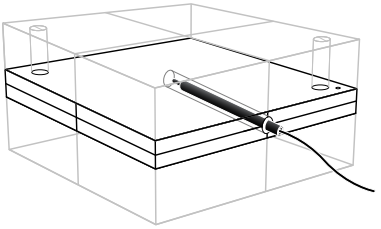
Overview Continued

Center Slab Configuration Details

Two standard configurations of the 2.0 cm thick center slab accommodate an ion chamber or film. The Heterogeneity Insert and SRS Dosimetric QA Slab provide additional options.

Ion Chamber Configuration

The Ion Chamber Configuration consists of a 2 cm slab with interchangable 5/8" diameter plugs drilled to accept an ion chamber of choice. The centroid of the chamber's collecting volume coincides with the center of the slab and can be identified radiographically with the center of mass of the embedded gold markers. Additional plugs for other thimble ion chambers or diodes are available.

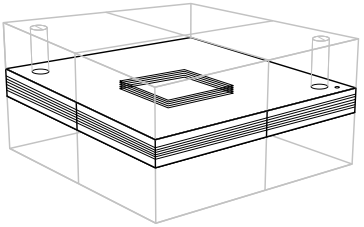


Ion Chamber Configuration
for dose measurements

Film Configuration

The Film Configuration consists of two 5 mm slabs and five 2 mm slabs. The 2 mm slabs are machined to precisely position film cut to dimensions of 63.5 mm x 63.5 mm (2.500" x 2.500", ± 0.007"); this stack of five 2 mm slabs is positioned between the 5 mm slabs. The recessed pocket in each slab accomodates the thickness of the GAF film.

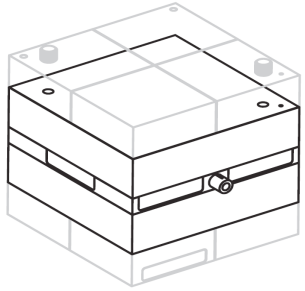
NOTE: It is advised to mark each individual film for identification and orientation purposes to avoid mistakes during assembly and disassembly of the phantom.



Film Configuration
for patient specific or treatment plan dose verification

SDVP Heterogeneity Insert Configuration (Optional, REF 72313)

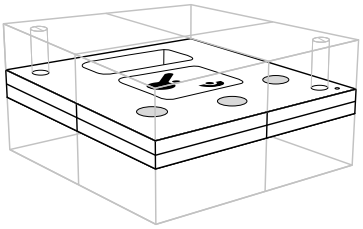
The SDVP Heterogeneity Insert consists of two 5 cm slabs of lung-equivalent material, and one 2 cm chamber slab. The chamber slab is placed between the two thicker lung slabs, and the entire lung-equivalent assembly is then placed between two standard Blue Water SDVP end slabs. The chamber plug with gold markers for the SDVP Heterogeneity Insert is made of Blue Water, and is designed to simulate a small tumor within the lung equivalent material. The SDVP Heterogeneity Insert is used with an ion chamber or other small detector to perform small field tests in a highly heterogeneous environment.



Heterogeneity Insert Configuration
for small field tests in a highly heterogenous environment

SRS Dosimetric QA Slab Configuration (Optional, REF 70650)

The SRS Dosimetric QA Slab is available as an accessory which provides a third option for the center slab. It contains targets which test treatment planning and CT number accuracy. Used in conjunction with the ion chamber and film configurations, the SRS Dosimetric QA Slab tests the accuracy of the TPS planned dose delivery. More information is available in the **Optional SRS Dosimetric QA Slab** section on page 6 of this manual.



Optional SRS Dosimetric QA Slab (REF 70650)

General Operation

The Stereotactic Dose Verification Phantom is easily set up for single beam dose output tests, as well as treatment plan delivery dose verification tests for a number of tracking methods.

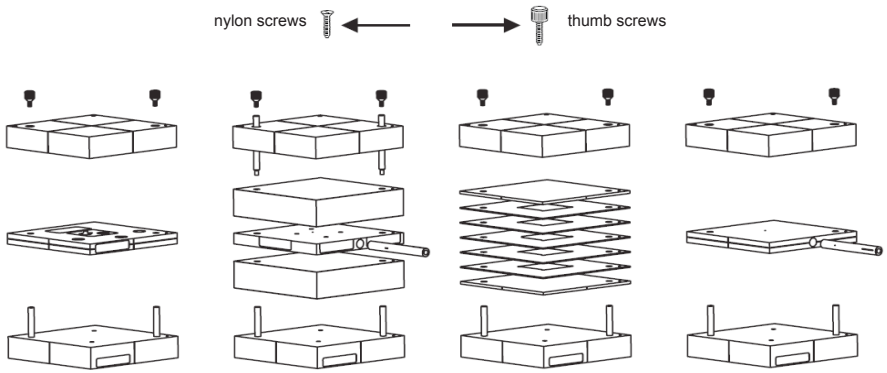
1. **General Phantom Setup and Assembly.** The alignment posts of the phantom do not allow accidental incorrect assembly of the phantom slabs. Rotated or inverted slabs are visually apparent. This is critical for the repeatability of assembly, as well as ensuring the embedded gold markers are in their correct orientation at all times. An alignment mark (similar to a dimple) is located in the corner of each slab for use as a quick visual guide. Orient each slab with this mark facing upward and directly over the mark on the previous slab.

   Once assembled, thread the desired screws into the alignment posts until firm – **do not over tighten!**

2. **Scanning the phantom with CT imager.** Arrange the assembled Stereotactic Dose Verification Phantom on the CT table and align appropriately. Use the same scan parameters as for a typical patient to scan the phantom.

3. **Position the phantom on the treatment couch.** Position the Stereotactic Dose Verification Phantom on the treatment table and properly align to the alignment lasers. Image the phantom to confirm that the phantom position matches the planning CT position.

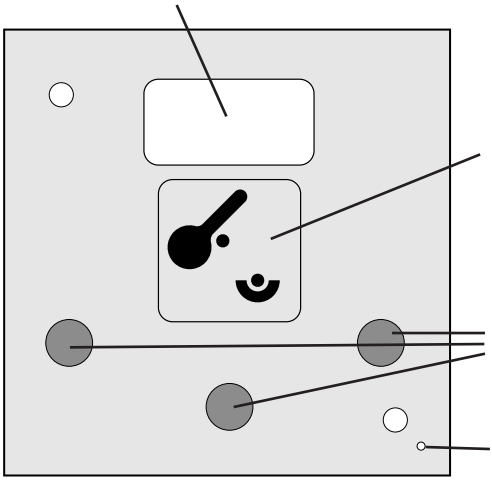
4. **Treat the phantom.** Treat the phantom as required to test the dosimetry and imaging functions of the specific TPS to be evaluated.



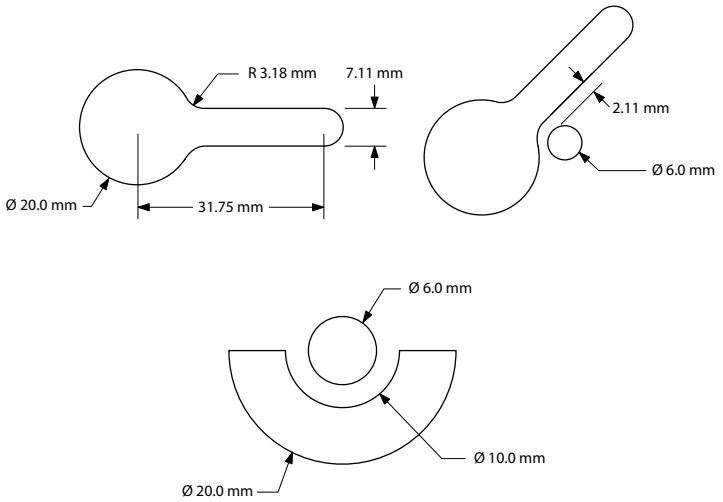
Four methods of Stereotactic Dose Verification Phantom assembly

SRS Dosimetric QA Slab

The SRS (Stereotactic Radiosurgery) Dosimetric QA Slab consists of three main components: air pocket, core target shapes, and CT density plugs. See material specifications section on page 18.



SRS Dosimetric QA Slab



Core Target Shape Dimensions (not drawn to scale)

The following section describes the steps required to perform:

- **Absolute Dose Traceability** where a simple multibeam isocentric forward plan is generated to the Stereotactic Dose Verification Phantom Ion Chamber Configuration (see page 4).
- **Collimator Output Dose Delivery** Verification is done using the smallest micro chamber in the ion chamber configuration. For example, using the 5 mm collimator with the output factor of 0.7, an inversely planned conformal plan is generated to an Exradin Micro Chamber with an expected dose of 10 Gy. The measured nC delivered to the phantom versus expected nC from the treatment plan should be within 5%.
- **Treatment Planning and Dose Delivery Conformality and Dosimetric Accuracy** Highly conformal plans are generated using the optional SRS Dosimetric QA Slab Configuration (see page 4) which contains the complex shape used for planning.

  After import of the plan into the CyberKnife delivery system, the plan is delivered to the Film Configuration (see page 4). A fiducial plan guarantees sub-millimeter positioning accuracy of the film since the fiducials are embedded in the top and bottom portion of the phantom.

  The resulting film can be placed directly on the conformality shape of the SRS Dosimetric QA Slab for a qualitative check of the actual delivered dose shape relative to the actual complex shape that was planned. If film dosimetry such as a calibrated RIT system is available, prescribed versus measured actual dose can also be verified from the film, as well as the Distance to Agreement(DTA) values. If desired, the highly conformal plan can also be treated to the Ion Chamber Configuration for an absolute dose delivered verification.
- **Patient Specific Dosimetry** is done using the MultiPlan patient overlay function to generate a copy of the patient plan onto either the 1) Ion Chamber Configuration or the 2) Film Configuration. Complex film dosimetry is not required because the measured film isodoses can be physically placed on the expected TPS isodoses for a quick qualitative check of the Rx isodose line, as well as the 90, 50, and 10 percent lines.

TPS Commissioning Test Examples

The CT studies of the SRS Dosimetric QA Slab Configuration can be used to confirm geometric and CT density number accuracy on the imported studies.

Contour volume size of the complex shapes embedded in the SRS Dosimetric QA Slab can be used to test the volumetric accuracy of the TPS software. Single beam dosimetry can be validated using the provided air cavity.

General Test Flow

CT images are acquired of each phantom configuration in one of two orientations depending upon the test to be conducted. Refer to Table 1: Dosimetry Test Description Summary. The general test work flow includes:

- CT study acquisition
- Import CT image sets as patient studies
- Treatment plans generation
- Import as patient treatments on the CyberKnife SGI Treatment Delivery System
- Generate the DRRs and confirm the prescription
- Setup and treat the phantom
- Compare measured results with the expected values.

Test Description	CT Setup Phantom Configuration	TPS Plan Method
Ion Chamber Configuration (Page 10)		
A. Absolute Dose Calibration Traceability	A. Model A19 Exradin Classic Farmer-type or other Farmer-type Chamber in the coronal plane	Forward isocentric plan with the 60 mm collimator to 10 Gy. Select a fiducial plan delivery. From the nC measured for 10Gy to a single beam, deliver multi beam plan to the chamber. Results should be within 2% of expected.
B. Collimator Dose Delivery Confirmation Using a Micro Chamber	B. Exradin Micro Chamber or other micro thimble in the coronal plane	Inverse conformal plan to the selected micro chamber using the 5 mm collimator and 80 cm SAD
TPS Commissioning and Dose Conformality Testing (Page 13)		
A. TPS Geometric Accuracy B. CT Density Model C. Single Beam Dose Calculation Tests D. Dose Conformality with Complex Shapes 1) C shape 2) Avoidance 6 mm Cylinders or Trigeminal Target 3) Tentacle	Place SRS Dosimetric QA Slab onto the alignment 4 cm slabs. Scan in both the transverse and coronal orientation. C. Add additional solid water blocks to achieve depth required for single beam dosimetry QA	Inverse planning A. When imported into the TPS, use the graphical user interface ruler to confirm the distances between the lead BBs. B. Measure CT numbers on the CT unit, then measure on the imported study to confirm that the CT density model that you have entered into the MultiPlan TPS are in agreement. C. Select the AQA path set to perform single beam dosimetry tests from either the AP or LAT beam position D. Generate highly conformal plans at each SAD
Film Dosimetry (Page 15)		
A. Conformal Relative Dose Delivery Accuracy	Place the Film Insert onto the bottom 4 cm slab alignment pins. Scan in both the coronal and transverse plane, i.e. the film in parallel to the CT table(coronal) and also parallel with the CT slice(transverse).	Plans generated to the Dosimetric QA phantom are delivered to the Film Phantom. The film is scanned to the Rx isodose line(IDL), and over lain directly onto the conformal shape that was planned.
B. Patient Dose Overlay Test (Example using Radiological Physics Center Dose Phantom)	Scan the Radiological Physics Center CyberKnife SRS phantom as instructed.	Using the MultiPlan overlay function to copy the desired treatment plan onto the Dose Film Phantom

Table 1: Dosimetry Test Description Summary

Ion Chamber Configuration

Configuration for CT Scanning

The Stereotactic Dose Verification Phantom is comprised of rectangular slabs of water-equivalent material which are precisely stacked together with two guideposts and either flat-topped or thumb screws. It is designed to accommodate many types of ion chambers or diodes. Four embedded gold fiducial markers provide positioning accuracy similar to the implanted fiducials used for patient alignment. All phantom configurations are scanned according to the Accuray treatment planning system requirements. Use a Field of View that fully encompasses the phantom, slice thicknesses of less than 1 tilt mm, and 120 kVp. The mA can be adjusted so that a reasonable grey scale range is obtained. If helical acquisition is used, choose the lowest pitch value possible.

Ion Chamber Configuration

A. Absolute Dose Calibration Traceability

The absolute dose insert houses plugs that are machined to accommodate most types and sizes of ionization chambers or diodes.

Typically the Farmer-type Chamber used to calibrate the linear accelerator is also used for the absolute dose traceability test. The chamber insert, depicted in Image 1, shows how the dose chambers and diodes are volumetrically centered to the geometric center of the phantom.

NOTE: The chamber location geometry is for convenience only, and allows use of the phantom with many treatment planning systems and linear accelerators. By rearranging the 4 cm slabs, monthly output checks can be done with this phantom.

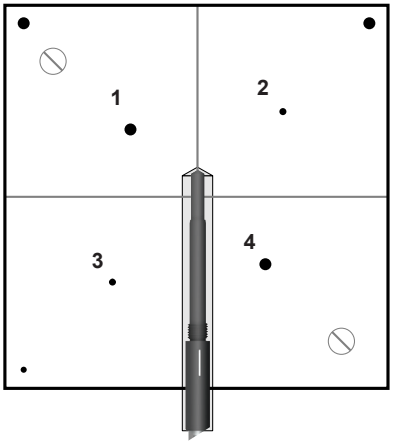


Image 1: Coronal View of the Model A19 Exradin Classic Farmer-type Chamber in the Ion Chamber Configuration of the Stereotactic Dose Verification Phantom

- Dots at the outer corners indicate the 1 mm BB positions to confirm the geometric accuracy of the imported CT study.
- Positions numbered 1 through 4 indicate the gold fiducial positions for image alignment during treatment delivery to the phantom.
- The Model A19 Exradin Classic Farmer-type Chamber volume is positioned at the geometric center of the phantom

Ion Chamber Configuration Continued

Absolute dose calibration verification treatment plan

Refer to Image 2 below with the Model A19 Exradin Classic Farmer-type ion chamber showing the precision placement of the four gold fiducials. Many types of chambers or diodes can be used with this insert using custom made plugs per request. Contact Standard Imaging regarding availability. Use an expansion of the FB volume to ensure that the active volume 97% dose cloud covers the active volume. Select 80 cm SAD and the 60 mm collimator used for the absolute dose calibration of the CyberKnife.

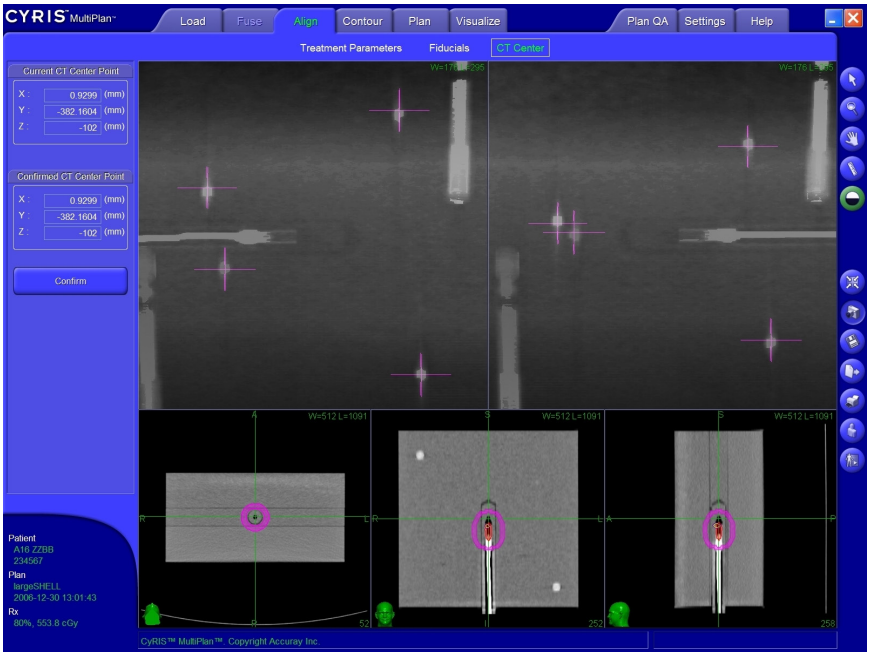


Image 2: Software image showing the Model A19 Exradin Classic Farmer-type Chamber and gold fiducial placement

Software screenshots used with permission of Accuray Incorporated.

B. Collimator Dose Delivery Confirmation Using a Micro Chamber

For the collimator dose delivery confirmation test, the smallest micro chamber is used.

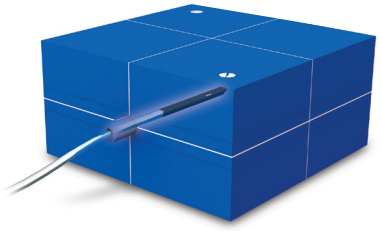


Image 3: Model A16 Exradin Micro Chamber in the Ion Chamber Configuration

Collimator Dose Delivery Test

Generate a conformal plan to the micro chamber using the trigeminal path set at 80 cm SAD. An nCI(new conformality index) of less than 1.5 should be achievable.

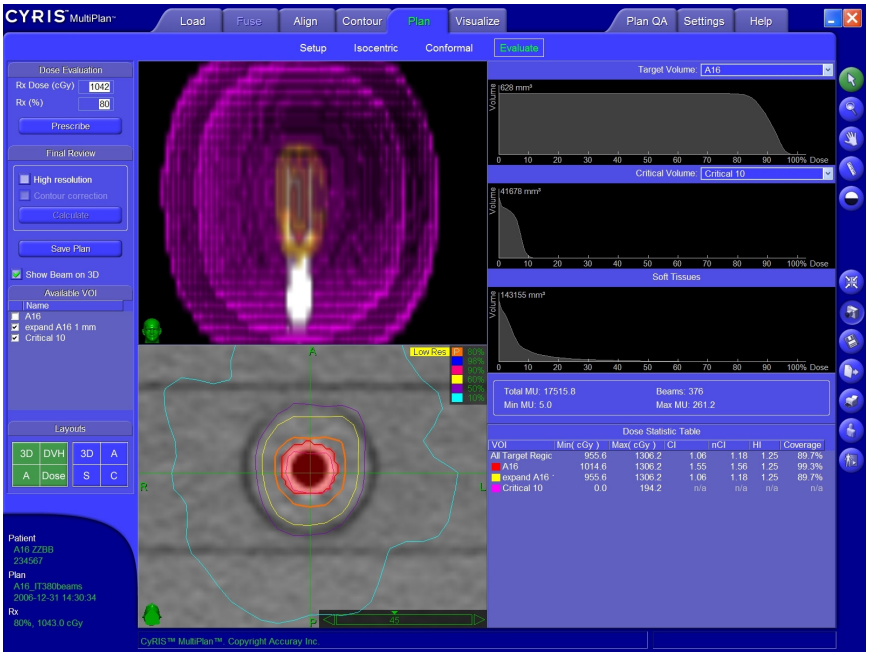


Image 4: Collimator Dose Delivery Accuracy Inverse Conformal Plan to a Model A16 Exradin Micro Chamber with 5 mm collimator. 80 cm SAD is recommended if trigeminal cases are to be done.

A. TPS Geometric Accuracy

The left – right and superior – inferior distance is 180 mm, while the anterior – posterior distance is 80 mm. The diagonal distance can be calculated as well to verify that the CT studies are imported without geometric distortion. Use the graphical ruler from the global tools on the right side of the CyberKnife software interface. See page 21 for dimension information.

B. CT Density Model

Left mouse click on the CT plugs to compare with the CT numbers measured on your local CT scanner where the SRS Dosimetric QA Slab Configured Phantom was scanned.

C. Single Beam Dose Calculation Tests

Use the AQA path to place a single beam on the SRS Dosimetric QA Slab Configured Phantom. The Physics Essentials manual supplied by Accuray contains detailed steps for single beam dosimetry analysis.

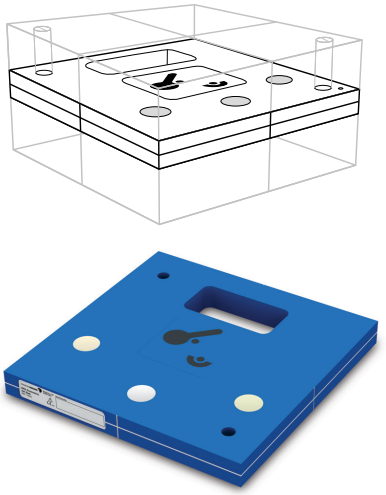


Image 5: SRS Dosimetric QA Slab shown within its Stereotactic Dose Verification Phantom configuration and independently

D. Dose Conformality with Complex Shapes

Several complex shapes are included in the SRS Dosimetric QA Slab. **See page 7 for shape dimensioning and material information.**

1) C Shape
2) Avoidance 6.0 mm Cylinders or Trigeminal Target
3) Tentacle

For example, a conformal plan is displayed to the C Shape in Image 6 where the 6.0 mm cylinder was treated as an avoidance object. The opposite can also be easily done using the 6.0 mm cylinder as a trigeminal object using the C Shape as the avoidance structure. When testing conformality, use the appropriate range of SADs and collimator sizes.

Once a plan similar to Image 6 is generated, import it into the SGI treatment delivery system, generate the DRRs for patient(phantom) setup, confirm the prescription, and deliver the plan to the phantom in the Film Configuration. The resulting film can be scanned at the prescription isodose line, and the 90%, 50%, and 20% lines relative to the point of maximum dose. Conformality of the dose delivered relative to the expected isodose lines can be evaluated. The film dose plot can be directly placed on the phantom for a qualitative relative dose analysis. If dose analysis software is available, the DTA between planned and measured doses can be determined, as well as the isodose level agreement.

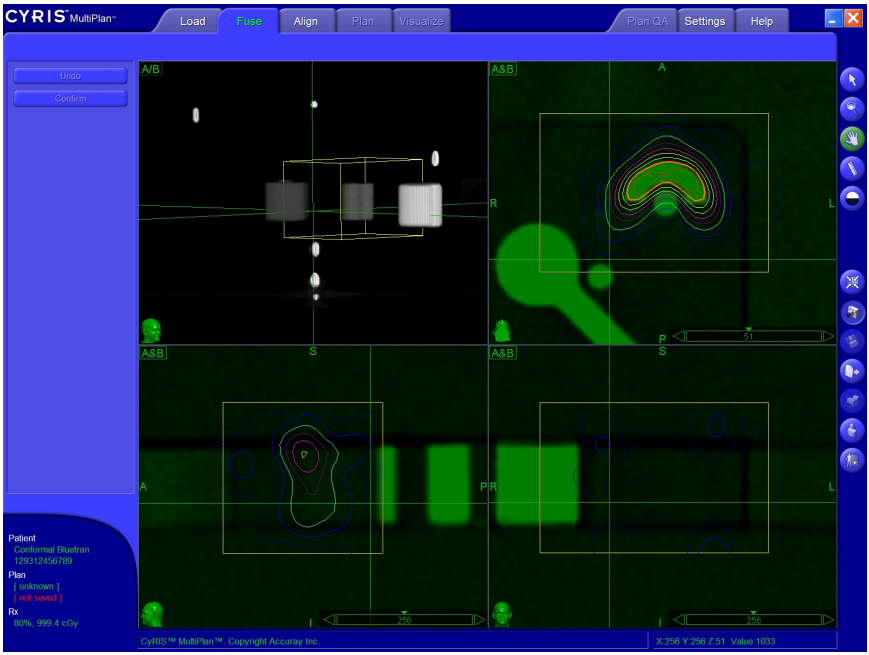


Image 6: Software image showing a conformal plan to the C Shape

Film Dosimetry

The Film Configuration is comprised of two slabs of 5 mm thickness plus five slabs of 2 mm thickness that have a recessed pocket to contain GAF film in a precise geometry relative to the phantom and the embedded gold fiducials. Either conformality test plans generated using the SRS Dosimetric QA Slab Configured Phantom, or patient overlay treatments are delivered to this phantom. The film insert and the fiducials allow precision placement of the phantom so that the expected plan relative and absolute dose is automatically aligned within the phantom.

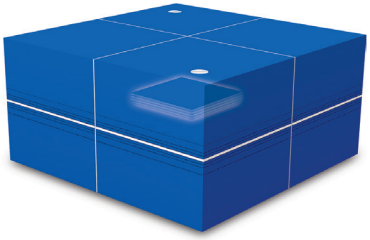


Image 7: Stereotactic Dose Verification Phantom shown in the Film Configuration

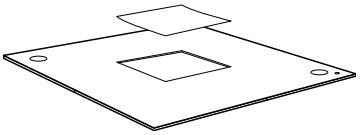


Image 8: 2 mm thick slab with recessed pocket to hold GAF film

A. Conformal Relative Dose Delivery Accuracy

A plan is generated to one of the complex shapes contained in the SRS Dosimetric QA Slab. The treatment is delivered to the Film Configured Phantom which is substituted for the SRS Dosimetric QA Slab Configured Phantom. The resulting film may then be scanned and the prescription isodose plotted. If the prescription isodose line is scaled to true dimension and then plotted, the plot can be physically overlain on the actual object for which the plan was generated. The plot of the prescription isodose and the complex shape should match within 1 mm of the approved isodose cloud encompassing the object for which the plan was generated and treated. (See Image 9)

B. Patient Dose Overlay Test — Uses either the Film or Ion Chamber Configuration for dose measurements

Film Dosimetry Continued

Any treatment plan generated using the SRS Dosimetric QA Slab Configured Phantom can be delivered to the Film Configured Phantom without using the overlay function. If patient specific QA is to be done:

1. Select the phantom overlay function
2. Select the film phantom
3. Select the patient plan that you wish to treat to the film DV phantom

An example phantom is depicted in Image 9 below. The plan can be delivered to the Film Configured Phantom to evaluate the relative isodose distribution of the plan for the example phantom depicted below in comparison with the distribution delivered to the Film Configured Phantom.

<u>NOTE</u>: The BODY treatment delivery selection must be made to deliver a fiducial treatment. The phantom needs to be placed AWAY from the head end of the table, and placed in a CHEST position to avoid collisions.

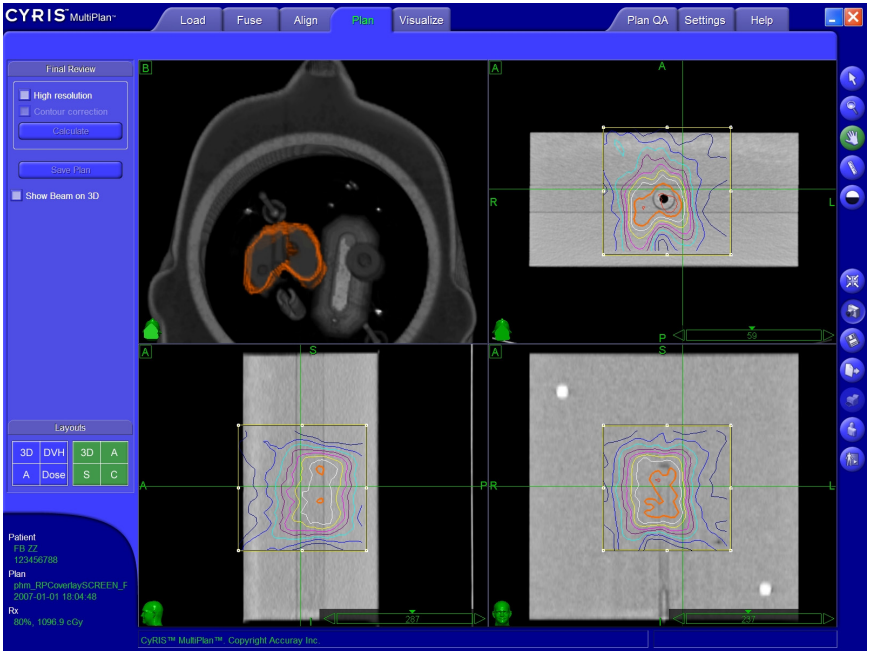


Image 9: An example phantom adapted for Fiducial Treatment Delivery.

SDVP Heterogeneity Insert

The SDVP Heterogeneity Insert is used with an ion chamber or other small detector to perform small field tests in a highly heterogeneous environment.

Extended guideposts are provided to assemble and align this configuration, and radio opaque alignment markers are present in both the chamber slab and the chamber plug.

Lung treatment planning and delivery may be tested using the following steps:

1. **Acquire CT Images.** Assemble the SDVP Heterogeneity Insert Configuration and acquire CT images. Note the fiducial markers located in both the lung and standard SDVP slabs as well as the chamber plug. Ensure that the chamber plug rotational orientation mark is aligned with the corresponding mark on the chamber slab.

2. **Create treatment plan.** Use the CT images to create a treatment plan and establish expected results.

3. **Align on treatment couch.** Place the phantom on the treatment couch and align with room coordinates. Insert the ion chamber into the plug, and the plug into the (middle) chamber slab. Ensure that the chamber plug is aligned as in step (1). Align the phantom initially using lasers or beam crosshairs. Adjust alignment of the phantom using image guidance if desired. For gated treatments, the phantom may be placed on a motion platform.

4. **Acquire measurement with ion chamber or other small detector.** Deliver the treatment plan to the phantom and acquire measurements with the ionization chamber.

5. **Compare the measurement data with expected results.**

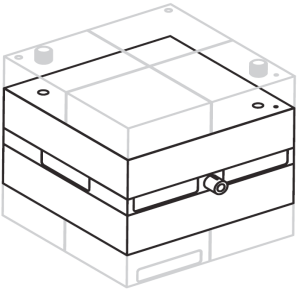


Image 10: Heterogeneity Insert Configuration

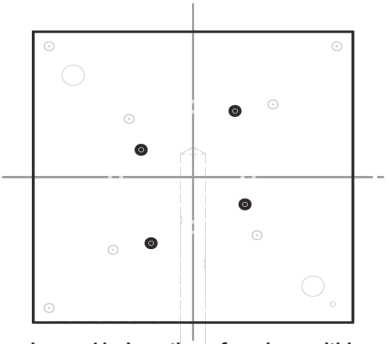


Image 11: Location of markers within Heterogeneity Insert Configuration

NOTE: Handle lung slabs with care. Lung material is soft and can be easily scratched or deformed with misuse.

Maintenance

Exterior cleaning of the device can be done with a soft brush and a cloth. Gently brush all surfaces to remove dirt and dust. Remove any remaining dirt with a cloth slightly dampened with a solution of mild detergent and water or a liquid disinfecting agent. Calibration is not required.

There are no serviceable parts on the Stereotactic Dose Verification Phantom.

If assistance is desired in the proper disposal or recycling of this product (including accessories and components), after its useful life, please return to Standard Imaging.

Parts and Accessories

REF	Description
70650	SRS Dosimetric QA Slab
71202	SDVP 91250 Plug with cavity drilled for ion chamber of choice
72313	Stereotactic Dose Verification Phantom Heterogeneity Insert
72771	Heterogeneity Insert 72313 Plug with gold markers and cavity drilled for ion chamber of choice
92726	Exradin A16 Ion Chamber, MicroPoint, 0.007 cc
92746	Exradin A26 Ion Chamber, MicroPoint, 0.015 cc
92739	Exradin W1 Scintillator
92722	Exradin A1SL Ion Chamber, Slimline Miniature Shonka, 0.053 cc
92723	Exradin A14SL Ion Chamber, Slimline MicroChamber, 0.015 cc
92749	Exradin A28 Ion Chamber, Scanning, 0.125 cc
92700	Exradin A12 Ion Chamber, Farmer-type Chamber, 0.64 cc
92734	Exradin A19 Ion Chamber, Classic Farmer-type, 0.62 cc
90015	MAX 4000 Electrometer
90018	SuperMAX Electrometer
70004	Extension Cable (available lengths: 1, 3, 6, 10, 15, 20, 25, 30 m or custom length)

Features and Specifications

Assembled Phantom Dimensions

Height	10.00 cm (3.94 in.)
Width	20.00 cm (7.87 in.)
Length	20.00 cm (7.87 in.)

Weight

Complete Stereotactic Dose Verification Phantom (ion chamber or film configuration)	4.4 kg (9.7 lbs.)
SRS Dosimetric QA Slab only	0.9 kg (2.0 lbs.)

Core Target Shape Volume

"Tentacle" Shape 	9.86 cm^3
"C" Shape 	2.38 cm^3
"Avoidance Structure" Shape 	0.56 cm^3

Included Components

(1) Bottom slab with imbedded gold markers, lead BBs, and integral alignment posts
(1) Top slab with imbedded gold markers and lead BBs
(1) 2.0 cm chamber slab with generic cavity hole
(2) Ion chamber plugs (drilled for Model A19 Exradin Classic Farmer-type Chamber and Model A16 Exradin Micro Chamber)
(1) Blank chamber plug
(2) 5.0 mm slabs
(5) 2.0 mm slabs with recessed pockets to accept 63.5 mm x 63.5 mm (2.500" x 2.500") film
(2) Flathead nylon 6/6 screws
(1) Flathead screwdriver
(1) User Manual

See www.standardimaging.com for applicable tech notes.
Specifications are subject to change without notice.

Material Densities

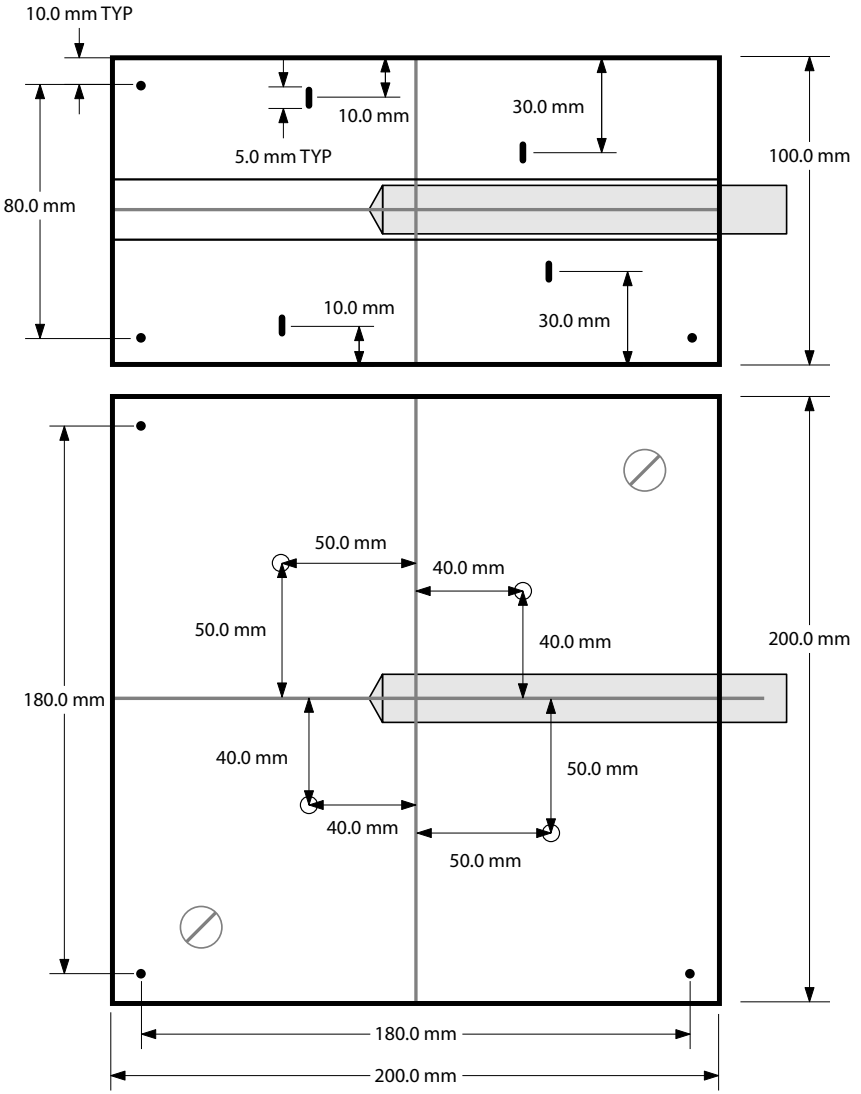
Main Phantom Components	Physical Density [g/cc]	Nominal CT value [HU]
Blue Water plastic	1.09	70
Black delrin alignment posts and thumbscrews	1.43	355
Nylon 6/6 flathead screws	1.14	100

SRS Dosimetric QA Slab	Physical Density [g/cc]	Nominal CT value [HU]*	Electron Density per cc x 10^{23}	Relative Electron Density to Water
Blue Water plastic	1.09	70	3.524	1.055
Black C552 target shapes	1.76	600	5.321	1.593
Cortical bone plug	1.91	1500	5.952	1.782
Trabecular bone plug	1.20	300	3.863	1.157
Adipose plug	0.94	-60	3.102	0.929

S.D.V.P. Heterogeneity Insert	Physical Density [g/cc]	Nominal CT value [HU]*	Electron Density per cc x 10^{23}	Relative Electron Density to Water
Blue Water plastic	1.09	70	3.524	1.055
Lung	0.280	-700	0.865	0.259

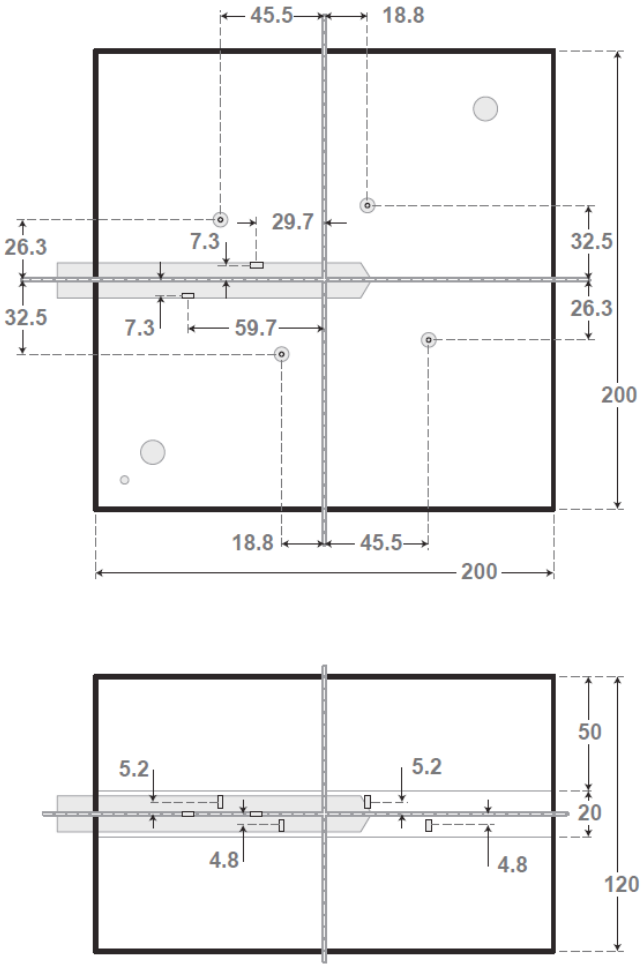
* HU Values may differ from those shown here, since these values are dependent on the CT scanner, scanner calibration, imaging protocol, and image reconstruction technique.

See www.standardimaging.com for applicable tech notes.
Specifications are subject to change without notice.



Dimensioned locations of the gold markers and BBs embedded within the phantom

See www.standardimaging.com for applicable tech notes.
Specifications are subject to change without notice.



Dimensioned locations of the gold markers and BBs embedded within the SDVP Heterogeneity Insert

See www.standardimaging.com for applicable tech notes.
Specifications are subject to change without notice.

Notes

Notes

Service Policy

If service, including recalibration, is required, please contact Standard Imaging's Customer Service department by phone or email prior to shipping the product. Standard Imaging's Customer Service and Technical Service staff will attempt to address the product issue via phone or email. If unable to address the issue, a return material authorization (RMA) number will be issued. With the RMA number, the product can be returned to Standard Imaging. It is the responsibility of the customer to properly package, insure and ship the product, with the RMA number clearly identified on the outside of the package. The customer must immediately file a claim with their carrier for any shipping damage or lost shipments. Return shipping and insurance is to be pre-paid or billed to the customer, and the customer may request a specific shipper. Items found to be out of warranty are subject to a minimum service fee of 1 hour labor (excluding recalibrations) for diagnostic efforts and require a purchase order (PO) before service is performed. With concurrence from customer, the product may be replaced if it is unserviceable or if the required service is cost prohibitive. Products incurring service charges may be held for payment. Standard Imaging does not provide loaner products. See the Standard Imaging Warranty and Customer Responsibility for additional information.

Return Policy

No merchandise will be accepted for credit without prior approval of return. Please contact Standard Imaging's Customer Service Department to receive a return authorization number before returning any merchandise for exchange or credit. Products manufactured by Standard Imaging must be returned within thirty days of receipt of order in 'like new' condition. No credit will be given for products returned after thirty days from receipt of order. A minimum twenty percent restocking fee will be charged on all returned merchandise. All materials returned must be shipped pre-paid. Credit for returned goods will be issued to customer's account for use against future purchases of merchandise only. Special orders, custom products, re-sale (not manufactured by Standard Imaging) products, and ADCL calibrations will not be accepted for return credit or exchange.

Serialization Information

Standard Imaging products that are serialized contain coded logic in the serial number which indicates the product, day and year of manufacture, and a sequential unit number for identification:

A YY DDD X

A Unique product ID (if applicable)
YY Last two digits of the year (e.g. 1999 = 99, 2000 = 00)
DDD Day of the year ($1 \leq DDD \leq 365$)
X Unique unit ID Number ($1 \leq X \leq 9$)

Customer Responsibility

This product and its components will perform properly and reliably only when operated and maintained in accordance with the instructions contained in this manual and accompanying labels. A defective device should not be used. Parts which may be broken or missing or are clearly worn, distorted or contaminated should be replaced immediately with genuine replacement parts manufactured by or made available from Standard Imaging Inc.

CAUTION: Federal law in the U.S.A. and Canadian law restrict the sale, distribution, or use of this product to, by, or on the order of a licensed medical practitioner. The use of this product should be restricted to the supervision of a qualified medical physicist. Measurement of high activity radioactive sources is potentially hazardous and should be performed by qualified personnel.

CAUTION: As desired by IAEA, English is the default language for labeling and manuals. If translated versions are available, resolve any differences in favor of the English versions.

WARNING: Proper use of this device depends on careful reading of all instructions and labels.

WARNING: Where applicable, Standard Imaging products are designed to be used with the versions of common radiation delivery devices, treatment planning systems and other products or systems used in the delivery of ionizing radiation, available at the time the Standard Imaging product is released. Standard Imaging does not assume responsibility, liability and/or warrant against, problems with the use, reliability, safety or effectiveness that arise due to the evolution, updates or changes to these products or systems in the future. It is the responsibility of the customer or user to determine if the Standard Imaging product can be properly used with these products or systems.

Should repair or replacement of this product become necessary after the warranty period, the customer should seek advice from Standard Imaging Inc. prior to such repair or replacement. If this product is in need of repair, it should not be used until all repairs have been made and the product is functioning properly and ready for use. After repair, the product may need to be calibrated. The owner of this product has sole responsibility for any malfunction resulting from abuse, improper use or maintenance, or repair by anyone other than Standard Imaging Inc.

Warranty

Standard Imaging, Inc. sells this product under the warranty herein set forth. The warranty is extended only to the buyer purchasing the product directly from Standard Imaging, Inc. or as a new product from an authorized dealer or distributor of Standard Imaging, Inc.

For a period provided in the table below from the date of original delivery to the purchaser or a distributor, this Standard Imaging, Inc. product, provided in the table is warranted against functional defects in design, materials and workmanship, provided it is properly operated under conditions of normal use, and that repairs and replacements are made in accordance herewith. The foregoing warranty shall not apply to normal wear and tear, or if the product has been altered, disassembled or repaired other than by Standard Imaging, Inc. or if the product has been subject to abuse, misuse, negligence or accident.

Product	Warranty Period
Standard Imaging Ionization Chambers	2 years
Standard Imaging Well Chambers	2 years
Standard Imaging Electrometers	5 years
Standard Imaging BeamChecker Products	2 years
Standard Imaging Software Products	1 year
All Other Standard Imaging Products	1 year
Standard Imaging Custom Products	1 year
Standard Imaging Remanufactured Products	180 days
Standard Imaging Custom Select Products	90 days
Consumables	90 days
Serviced Product	90 days
Resale Products	As defined by the Original Equipment Manufacturer
ADCL Product Calibration (Standard Imaging uses the UW-ADCL for recalibrations required under warranty, unless otherwise requested)	0 - 90 days = 100% of ADCL Calibration Costs 91 - 182 days = 75% of ADCL Calibration Costs 183 – 365 days = 50% of ADCL Calibration Costs 366 – 639 days = 25% of ADCL Calibration Costs (days from date of shipment to customer)

Standard Imaging's sole and exclusive obligation and the purchaser's sole and exclusive remedy under the above warranties are, at Standard Imaging's option, limited to repairing, replacing free of charge or revising labeling and manual content on, a product: (1) which contains a defect covered by the above warranties; (2) which are reported to Standard Imaging, Inc. not later than seven (7) days after the expiration date of the warranty period in the table; (3) which are returned to Standard Imaging, Inc. promptly after discovery of the defect; and (4) which are found to be defective upon examination by Standard Imaging Inc. Transportation related charges, (including, but not limited to shipping, customs, tariffs, taxes, and brokerage fees) to Standard Imaging are the buyer's responsibility. This warranty extends to every part of the product excluding consumables (fuses, batteries, or glass breakage) or material reactions. Standard Imaging, Inc. shall not be otherwise liable for any damages, including but not limited to, incidental damages, consequential damages, or special damages. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days.

This warranty is in lieu of all other warranties, express or implied, whether statutory or otherwise, including any implied warranty of fitness for a particular purpose. In no event shall Standard Imaging, Inc. be liable for any incidental or consequential damages resulting from the use, misuse or abuse of the product or caused by any defect, failure, malfunction or material reactions of the product, whether a claim of such damages is based upon the warranty, contract, negligence, or otherwise.

This warranty represents the current standard warranty of Standard Imaging, Inc. Please refer to the labeling or instruction manual of your Standard Imaging, Inc. product or the Standard Imaging, Inc. web page for any warranty conditions unique to the product.