SRS commissioning and treatment verification

Stereotactic Radiosurgery (SRS) necessitates a high degree of accuracy in target localization and dose delivery. Small errors can result in significant under treatment of portions of the tumor volume and overdose of nearby normal tissues. The CIRS Stereotactic End-to-End Verification Phantom “Steev” provides a means to check every step the patient will undergo in the treatment process.

Accurate patient simulation

Steev’s anthropomorphic exterior allows for use of multiple positioning and fixation devises as used in clinical application. Internal details such as cortical and trabecular bone, brain, spinal cord, teeth, sinuses and trachea provide the most realistic clinical simulation to evaluate the challenging effects of complex intra- and extra-cranial anatomies. Geometric and organic target inserts provide means for comprehensive image QA, geometric machine QA and TPS QA for increased confidence in system performance.

Dose measurements at isocenter and off isocenter positions

Steev accommodates a variety of interchangeable tissue equivalent inserts suitable for small field dosimetry including: micro- and pin-point ion chambers, film, MOSFET, TLD, OSL (nanoDot™) and 3D gel. When used in concert with the various imaging inserts, Steev provides the most comprehensive end to end testing and QA solution for SRS systems.
Improve the accuracy of target dose delivery and treatment plan verification in radiosurgery and radiotherapy

**DOSEMISTRY OPTIONS**

- Ion Chamber Target Dosimetry Insert (038-3-CVXX-00)
  - Kit includes two brain equivalent cubic inserts with spherical targets Ø 10 and 30 mm (contrast +2%) located at ISO center. The targets align to phantom's external CT/MRI fiducial markers. Each insert is machined with a reproducible axis offset (± 0.2 mm) and a homogenous brain-equivalent material that can be filled with a 3D gel polymer or other liquids.

- Single Film Target Dosimetry Insert (038-11)
  - The cube features groves that enable easy orientation of film scans in the TPS.

- Film Stack Insert (065-FC)
  - The film stack cubic insert accommodates 13 radiographic films with 4 mm spacing for quasi-3D dosimetry. The cube features grooves that enable easy orientation of film scans in the TPS.

- Gel Cassette Insert (065-GC)
  - The brain-equivalent cubic insert includes a removable NAREX container. It can be filled with a 3D gel polymer or other liquids.

- TLD Dosimetry Insert (038-06)
  - Kit includes a homogeneous brain-equivalent cubic insert that can be filled with a 3D gel polymer or other liquids.

- Variable Position Ion Chamber Dosimetry Kit (038-4-CVXX-00)
  - Kit includes a homogenous brain-equivalent cubic insert with a through hole along the IS axis that aligns to two ion chamber access holes that run through the neck of the phantom in the IS direction. The kit also includes positioning plugs that enable small volume ion chamber as specified by the customer to be positioned at ISO center and off ISO center by 3cm in the anterior direction and an infinite number of positions up to 3cm superior and -210 mm inferior. The posterior hole runs adjacent to the trachea and the anterior hole runs thru sinu corr. C5 and C7 vertebrae are used to allow for measurements in challenging, high dose gradient regions of interest.

- TLD Dosimetry Insert (038-06)
  - Brain-equivalent cube with 5x5 grid at O5

- TLD Dosimetry Insert (038-06)
  - Brain-equivalent cube with 5x5 grid at O5

- Multi-Film Target Dosimetry Insert (038-05)
  - The insert contains a 5x5x5 grid of Ø5 mm through holes to accommodate TLD rod or cube holders to accommodate TLD chip holders (700-01-BT) that allow for 2D or 3D dose verification.

- TLD Dosimetry Insert (038-06)
  - Brain-equivalent cube with 5x5 grid at O5

**MULTI-MODALITY IMAGING OPTIONS**

- MRI/PET/CT ISO Center Rectangular Insert (038-15)
  - The insert can be filled with MRI or PET compatible liquids. It features a Ø3.2 mm ceramic BB fiducial at ISO center aligned to the phantom external CT/MR fiducials. The insert generates adequate MR signal strength to resolve the external phantom fiducials and can be used alone or in combination with other imaging inserts to evaluate fusion functions of treatment planning systems.

- MRI/PET/CT Spherical Target Rectangular Insert (038-11)
  - This insert provides an MRI/PET/CT image reconstruction test tool. Its precise Ø30 mm spherical tumor internal volume allows for assessment of image and reconstruction integrity when images are moved among different imaging systems. Together with the “matching target” in the Ion Chamber Target Dosimetry Kit (038-3-CVXX-00), it enables enhanced end-to-end testing of image acquisition, planning and delivery.

- CT LINEARITY OPTION

- Electron Density Cube with Customable 1° Vial for Real Water Electron Density Plug (038-09)
  - Brain-equivalent cubic insert includes a tissue-equivalent electron density reference plug as featured in Model 560M. The cubic comes standard with the Water Equivalent Material Surrounding Removable Ø 1° Vial for Real Water or other liquids.

- POSITION & LOCALIZATION OPTIONS

- Cube with O5 mm Centroid & Offset Targets (038-10)
  - The brain-equivalent cubic insert contains a Ø5 mm ceramic, BB fiducial at the centroid and a Ø30 mm target that is offset from the center, in three orthogonal planes with distances 15, 20, and 30 mm respectively. This is designed to aid in Winston-Lutz tests for isocenter verification and localization/ repositioning with couch shift.

- Cube with O62M. The cube comes standard with the Water Equivalent Material Surrounding Removable Ø 1° Vial for Real Water or other liquids.

- MR/PET/CT Spherical Target Rectangular Insert (038-11)
  - This insert provides an MRI/PET/CT image reconstruction test tool. Its precise Ø30 mm spherical tumor internal volume allows for assessment of image and reconstruction integrity when images are moved among different imaging systems. Together with the “matching target” in the Ion Chamber Target Dosimetry Kit (038-3-CVXX-00), it enables enhanced end-to-end testing of image acquisition, planning and delivery.

- OUR MOST COMPREHENSIVE, REALISTIC, END-TO-END SRS/SRT TESTING TOOL

- Perform End-to-End testing for commissioning as directed by AAPM TG-101
- Verify patient positioning using frame/frameless systems, head and shoulder masks or other positioning fixation devices
- Verify patient treatment plan in critical regions
- Perform geometric machine QA - Winston-Lutz isocenter verification tests and localization/repositioning with couch shift
- Perform IORT QA procedure for X-ray and onboard kV and MV imagers including CBCT
- Assess image fusion, image transfer QA, accuracy verification and TPS testing with Multi-modality imaging capabilities (CT, MRI and PET)
- TPS Deformable Image registration algorithm accuracy QA

AAPM TG-101 report

Stereoratric body radiation therapy

...cumulative system accuracy for the procedure [SBRT can be significant and needs to be characterized through an end-to-end test using phantoms with measurement detectors and imaging.*}
**WORK IN PROGRESS**

MRI/PET/CT Spatial 3D Distortion Rectangular Insert
This insert contains a 3D grid (10 x 10 spacing) of Ø 1 mm high contrast wire (~600HU). The insert can be filled with MR or PET compatible liquids. It provides a single, precise tool to check image distortion across multiple modalities.

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**SPECIFICATIONS**

### MODEL 038 INCLUDES

<table>
<thead>
<tr>
<th>QTY</th>
<th>PART NO.</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>1</td>
<td>038</td>
<td>038 Stereotactic Radiosurgery Head</td>
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<tr>
<td>1</td>
<td>605-SS1</td>
<td>Brain Equivalent Spacer (63.4 x 63.4 x 10 mm)</td>
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<tr>
<td>1</td>
<td>605-SS2</td>
<td>Brain Equivalent Spacer (63.4 x 63.4 x 20 mm)</td>
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<tr>
<td>1</td>
<td>605-SS4</td>
<td>Brain Equivalent Spacer (63.4 x 63.4 x 63.4 mm)</td>
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<tr>
<td>1</td>
<td></td>
<td>Solid Ø 12.5 mm (posterior chamber access plug)</td>
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<tr>
<td>1</td>
<td></td>
<td>Solid Ø 12.5 mm anterior chamber access plug with MR/CT fiducial</td>
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### MODEL 038 OPTIONAL ACCESSORIES

<table>
<thead>
<tr>
<th>QTY</th>
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<tbody>
<tr>
<td>1</td>
<td>038-01</td>
<td>Shoulders (additional 100 mm width)</td>
</tr>
<tr>
<td>1</td>
<td>038-02</td>
<td>ABS Vacuum formed cradle</td>
</tr>
<tr>
<td>1</td>
<td>038-03- CvXX-XX</td>
<td>Ion Chamber Dosimetry Kit: (1) 63.5 mm Cube with Ø30 mm Spherical Target Cavity, (2) 0.127 mm Sleeves for adapting ion cavity, (1) Solid plug with Ø 3.2 mm BB in ISO center (ceramic), (1) Solid plug with Ø 3.2 mm aluminum oxide BB in ISO center, (1) Solid cavity plug with Ø3.2 mm aluminum oxide BB in ISO center, (1) Solid cavity plug, (1) Spacer plug set to accommodate cavity at different positions</td>
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<tr>
<td>1</td>
<td>038-04- CvXX-XX</td>
<td>Variable Ion Chamber Position Dosimetry Kit: (1) 63.5 mm Cube with cavity thru hole, (2) 0.125 mm Sleeves for adapting ion cavity, (1) Solid cavity plug with Ø3.2 mm aluminum oxide BB in ISO center, (1) Solid cavity plug, (1) Spacer plug set to accommodate cavity at different positions</td>
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<tr>
<td>1</td>
<td>605-FC</td>
<td>Film Stack</td>
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<tr>
<td>1</td>
<td>038-05</td>
<td>Film Cube for Single Film Dosimetry with Ø30 mm target</td>
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<tr>
<td>1</td>
<td>038-06</td>
<td>TLD Dosimetry Cube</td>
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<tr>
<td>1</td>
<td>605-GC</td>
<td>Gel Cassette (includes B6 Gel Container)</td>
</tr>
<tr>
<td>1</td>
<td>038-09</td>
<td>Electron Density Cube with Real Water Electron Density plug (Water Equivalent Material Surrounding Removable Ø 1” Vial)</td>
</tr>
<tr>
<td>1</td>
<td>038-10</td>
<td>Cube 63.5mm with Centroid &amp; Offset Ø5mm targets</td>
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<tr>
<td>1</td>
<td>038-11</td>
<td>MRI/CT/PET Target Cube with Ø30mm target</td>
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<td>MRI/CT/PET Target Cube with 25 cc Organic target</td>
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<td>MRI/CT/PET Target Cube with 50 cc Organic target</td>
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<tr>
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<td>MRI/CT/PET Spatial 3D Distortion rectangular insert</td>
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Medical Device Depot
www.medicaldevicedepot.com
1-877-646-3300

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