

Logos Treatment Chair Adapter (LTCA)

Proton and X-Ray Beam Metrology — Logos Systems Int'l

LTCA Features and Benefits:

- Attaches securely to the chair backrest for true end-to-end QA measurements
- Enables chair Star-shot measurement and analysis quickly using the XRV-124 or XRV-325
- Holds Falcon, Eagle, or Hawk phantoms for 20x20, 32x32, or 32x42 cm XY measurements
- Easy handling and alignment for quick and repeatable mounting
- Velour base padding to prevent scratches
- Lever-actuated silicone bumpers grip the chair edge to secure the LTCA



Logos Treatment Chair Adapter



XRV-124 Mounted to a Treatment Chair using the LTCA

The advent of upright RT using treatment chairs brings new options to the proton therapy world. This advancement brings new challenges for ensuring the highest delivery accuracy. The LTCA helps users maintain high confidence in setup consistency between QA measurements and treatment delivery.

The LTCA connects directly to the backrest to enable measurements utilizing the chair in its typical treatment configuration. Keeping the backrest in place and mounting the LTCA eliminates multiple chair configuration changes and enables the use of all current Logos Camera Phantoms.

Attach the XRV-124 or XRV-325 for advanced radiation isocenter verification, just as if it were performed within a conventional gantry system. Use the Falcon, Eagle, or Hawk to measure XY spot positions and complete range constancy verification with the same setup. ARC-200 compatibility enables capture of chair-based proton arc deliveries, providing depth data as well as position data from within the phantom.

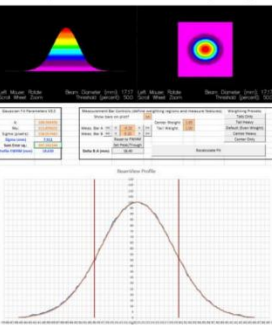


XRV-325 3D Digital Camera Phantom

Proton and X-Ray Beam Metrology — Logos Systems Int'l

Features and Benefits:

- Real-time Proton and X-ray 3D beam vector and profile capture over 360 degrees of rotation
- Large cone captures beams or fields between 3 and 100 mm
- Filmless Winston-Lutz delivery analysis and report generation
- Multi-energy Star Shot capture for gantry isocenter analysis
- PBS layer integration and analysis
- Proton ARC and VMAT captures up to 10 minutes long with analysis tools
- VolumeWorks XL reconstructs 3D fluence volumes 10 x 10 x 15 cm
- Suspended fiducial for targeting



3D beam profile viewing with Gaussian fitting module



XRV-325 Detector Phantom

The XRV family of X-ray and proton beam inspection systems combine precision metrology with high-energy radiation detection to form a fully electronic alternative to film-based measurements. The XYZ locations and vectors of radiation beams can be measured with unmatched speed and accuracy. Beam vector, profile, timing, intensity, and divergence can be obtained in seconds rather than hours. Automation scripts can be used to capture changes in the beam shape, intensity, location, and direction over time for use in later analysis or 3D volumetric reconstruction.

XRV systems verify that the radiation therapy subsystems (robot, collimator, radiation source, and kV imagers) are working together to accurately deliver radiation to intended region. Beam position measurements are accurate to 0.3 mm and repeatability is typically 0.03 mm. Vector and beam viewing software enables real-time any-angle viewing of the captured data. Up to 4,000 frames of video can be captured real-time at rates from 1 to 75 frames per second.

Rotational symmetry allows for continuous capture of ARC style deliveries without phantom movement. ARC delivery images can then be combined and unrolled to perform 2D gamma-style analysis comparison between a captured dataset and TPS output. Automatic script-based separation of multiple energy deliveries allow comparison to TPS output for individual layers. The XRV's unique 3D fluence reconstruction capabilities unlock a new category of 3D quality assurance.

All XRV operations are controlled via included high-performance laptop. The XRV comes with a 30-meter (100 feet) power-over-fiber USB cable system so that the system PC and operator can be located safely away from the treatment room during delivery. The detector phantom weighs approximately 8 kilograms (17 pounds).

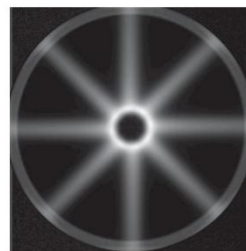


ARC-200 2D/3D Phantom

Proton and X-Ray Beam Metrology — Logos Systems Int'l

Features and Benefits:

- Real-time Proton and X-ray beam profile and position capture
- 60 – 240 MeV proton beam measurement
- 360-degree Gantry Rotation capable, no repositioning required
- Effective Resolution 0.2 mm with 8 or 12-bits per pixel
- Capable of measuring beams up to 40mm in diameter
- Automatic Measurements for R100, P80, D80, P90, D90, and D20
- FLASH-ready 100-400 fps captures
- BeamWorks Strata software includes GUI or script operation
- Integrated of individual frame capture modes
- Standard Glass Scintillator with Plastic option



Bragg Peak Star-Shot Delivery Integration



ARC-200 Phantom

The ARC-200 Beam Viewer combines high-energy radiation detection with precision metrology to form a completely electronic alternative to film-based measurements. The ARC-200 captures and measures the beam profile and integrated dose depth of radiation beams with unmatched speed and accuracy.

Single beams and single axis proton spot scans may be directed at the scintillator disk from any gantry orientation for capture and measurement. Complex proton arc deliveries are also supported. Automation scripts can be used to capture changes in the beam shape, intensity, location, and range depth at camera speeds from 100 up to 400 frames per second.

For proton range verification, the Glass Scintillator has a WER of 1.9 allowing direct measurement of beams up to 240 MeV along the 200 mm beam path. Proton range accuracy is better than 0.8 mm.

A Plastic Scintillator measuring 190mm in diameter by 55mm depth can also be used in the ARC-200. The Plastic Scintillator has a WER of 1.03 which allows for tissue-equivalent capture and analysis.

The correct operation of pencil beam scanning or high-density collimators can be quickly verified with the BeamWorks Strata analysis software. Beam position and width measurements are accurate to 0.2 mm and beam dose depth measurements can be accurate up to 0.5 mm. Captured images can also be exported to ProfileView, BraggPeakView, or third-party image analysis software applications like ImageJ.

All operations are controlled by the software on a laptop or desktop PC supplied with the camera phantom.

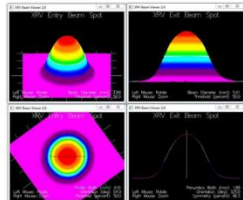


XRV-3000 Eagle Beam Profiler

Proton and X-Ray Beam Metrology — Logos Systems Int'l

Features and Benefits:

- Proton and X-ray beam profiling and Quality Assurance
- Real-time 320x320 mm beam profile and position capture
- 360-degree rotation with optional Gantry Cradle
- Effective Resolution 0.3 mm at 8 or 12-bits per pixel
- Flexible scintillator, fiducial, wedge, and build-up options
- BeamWorks Strata software includes GUI or script operation
- Integrated or individual frame capture modes
- Advanced beam profile viewing and measurement
- Statistical analysis macros for easy export to spreadsheets
- Proton range verification using optional Ranger-300 or LCW-300



3D Beam Profile Viewing



XRV-3000 Eagle Phantom

The XRV-3000 Eagle Beam Profiler combines high-energy radiation detection with precision two-dimensional metrology to form a completely electronic alternative to film-based measurements. The XRV-3000 Eagle measures the XY location and profile of radiation beams with unmatched speed and accuracy. Single beams and proton energy layer patterns up to 30 x 30 cm in size may be directed at the scintillator surface from vertical and horizontal orientations for measurement. Automation scripts can be used to capture changes in the beam shape, intensity, and location over time.

XRV phantoms calibrate proton and radiosurgery systems or industrial radiation sources that must deliver precise amounts of radiation to targeted regions in 3D space. The correct operation of pencil beam scanning or mechanical leaf collimators used in these systems can be quickly verified. Beam FWHM diameter measurements are accurate to +0.1 mm and centroid positions to 0.3 mm. Beam viewing software enables real-time any-angle viewing of the captured profile data with live penumbra and symmetry-style measurements. Captured images can be exported to ImageJ or other image analysis software.

All operations are controlled by a laptop or desktop PC supplied with the camera phantom. The XRV comes with a 30 meter (100 feet) USB3 power-over-fiber extender cable so that the system PC and operator can be located safely away from the radiation source. The digital camera phantom weighs approximately 7.0 kilograms (15.5 pounds) and is stored in the Pelican case provided as part of the system.

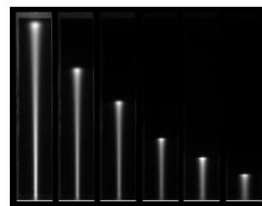


Ranger-300 Proton Energy Verification

Proton and X-Ray Beam Metrology — Logos Systems Int'l

Features and Benefits:

- Fast Bragg peak measurement of proton and heavy ion beams up to 30 mm in diameter
- 50 – 225 MeV proton beam standard range
- 70 – 235 MeV proton beam range with acrylic range shifter
- 75 – 244 MeV proton beam range with PTFE range shifter
- Accuracy better than 0.5 mm
- Mounting options available for the XRV-3000 Eagle and XRV-4000 Hawk
- Easy handling for use at all gantry angles
- BraggPeakView software for image analysis and measurement
- Excel analysis template provided



Proton beam Bragg peak images



Ranger-300 mounted on the XRV-4000 Hawk Phantom

The Ranger-300 is a module that mounts onto the XRV-3000 Eagle or XRV-4000 Hawk for the purpose of imaging the Bragg peak of proton and heavy ion beams. The Ranger is oriented such that the hadron beam enters the end of a plastic scintillator block that is approximately 305 mm long and has a water equivalent thickness of approximately 1.04. As the ions slow down, light is generated and the beam image is reflected off the phantom mirror to the USB camera. The entire path of the beam from the scintillator entry point through the Bragg peak region is captured by the camera at a resolution of approximately 0.3 mm per pixel. The resolution of the camera in that orientation is 1200 pixels.

The entry of the Ranger-300 is a 1.6 mm thick opaque window of acrylic (PMMA) upon which additional blocks of range shifting material may be added and held in place via thumbscrews. The standard water equivalent range of 320 mm can be extended to 350 mm with the included 25 mm acrylic (PMMA) insert. The optional 25 mm PTFE insert extends the water equivalent range to 360 mm. More energetic beams can be measured with custom inserts of either longer dimensions and/or denser composition.

The 55 mm width and height of the plastic scintillator allows images of beams up to 30 mm in diameter to be captured and measured by the Eagle or Hawk. Existing owners of the XRV-3000 and 4000 will receive a software upgrade in order to handle the Ranger-300 imaging and measurement requirements. Please contact us for custom configurations of the Ranger-300 design.