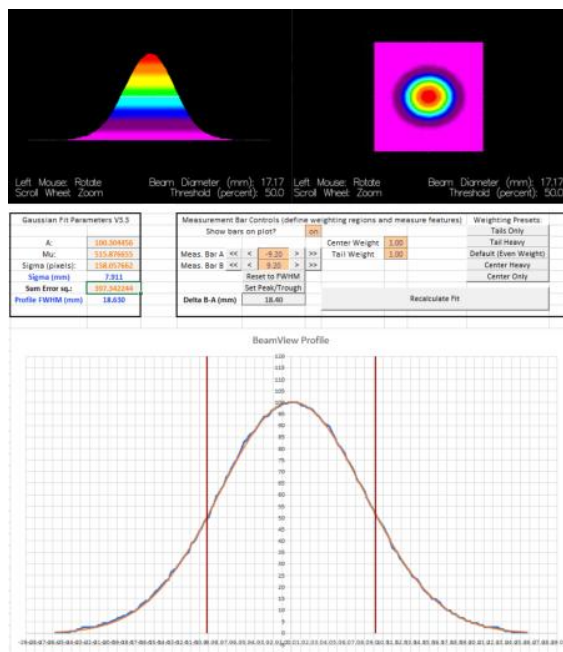


XRV-325 3D Digital Camera Phantom

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

XRV-325 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



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.

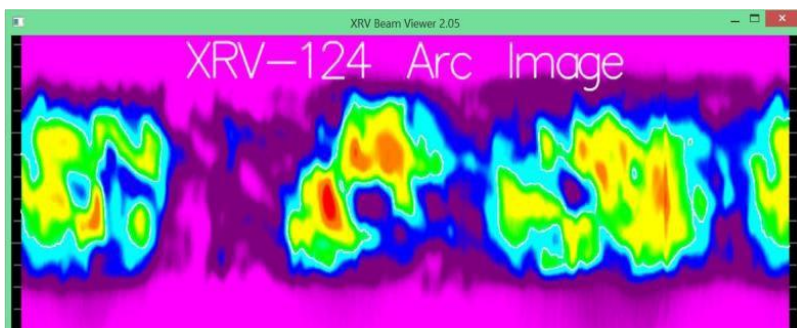
Rotational symmetry allows for continuous capture of ARC style deliveries without phantom movement. ARC delivery images can then be combined and unrolled to perform 2D gamma-style analysis comparison between a captured dataset and TPS output. Automatic script-based separation of multiple energy deliveries 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).

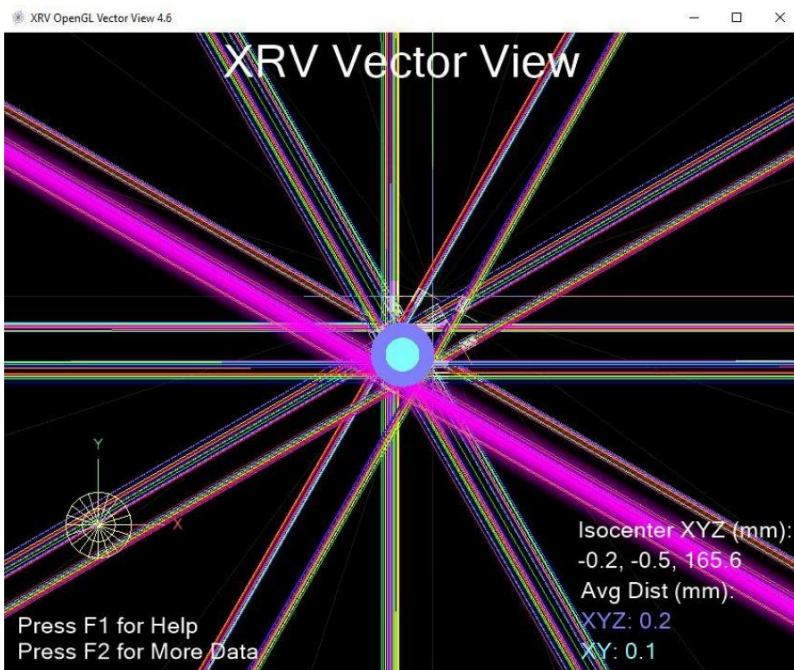
XRV Operation

The XRV phantom is first imaged with a CT scanner so that the fiducials establish the treatment dose position during delivery. Every beam of the treatment plan can then be measured for delivery accuracy. The patented XRV technology works on the principle of the hodoscope: the X-ray or proton beam creates visible beam spots on the surface of the scintillator imaging cone at the front of the phantom. A sensitive camera then digitizes the beam spots and transfers the bitmap to the XRV computer for computation into 3D vector and profile data.

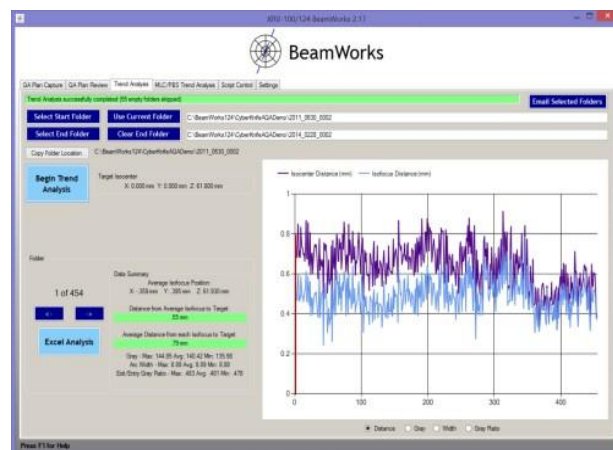
The BeamWorks and ArcWorks software is used to acquire, analyze, and archive XRV images. Beam vector and shape data are displayed in 3D using advanced GPU enabled algorithms. BeamWorks Delta allows two treatment plan captures to be compared beam-by-beam. VolumeWorks XL uses the captured vector and profile data to approximate the 3D treatment volume. Vectors and voxels are displayed together to represent volumes up to 10x10x15 cm.



Unrolled representation of a continuous ARC style delivery, which can be used for gamma-style analysis.



Vector Viewer tool showing 144 beams delivered for multi-energy isocenter verification.



BeamWorks Target Accuracy Trend Analysis

XRV-325 Specifications:

Accuracy: ¹

XYZ Beam Center:	0.3 mm (hi-res)
Repeatability:	±0.03 mm (typical)
Vector Theta/Phi:	0.2 degrees (hi-res)
Repeatability:	±0.075 mm (typical)

Optical System: ¹

Resolution:	1200 x 1200 pixels or 600 x 600 pixels (2x2 bin)
Capture Rate:	0.1- 200 frames/sec
Cone Angle:	45 degrees
Usable Cone Region:	210 mm over 360 deg. Width: 30-100 mm
Lens MTF:	Megapixel resolution
Camera Interface:	USB 3.0

Camera Shielding: ²

Top and Sides:	12.7 mm bismuth polymer composite
Camera Lifetime:	~1,500 beam hours

Camera Module Physical:

H x W x D:	26 x 25 x 78 cm
Weight:	5.0 kg (11 lbs)
Enclosure Material:	Aluminum and Plastic

Interface:

Capture Trigger:	Auto, GUI, Script, or Network watch-file
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Computer Components:

Configurable to customer requirements

General:

Electrical Power:	110-220V or battery
Environment:	5 to 30 degrees C; 90% humidity, no condensation; minimal vibration

NOTES:

1. Contact us for higher camera resolutions.
2. Contact us for custom shielding requirements. The camera may be replaced for a service fee after approximately 3 years as necessary.
3. Contact us for custom PC requirements.

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