

# 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



## 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.

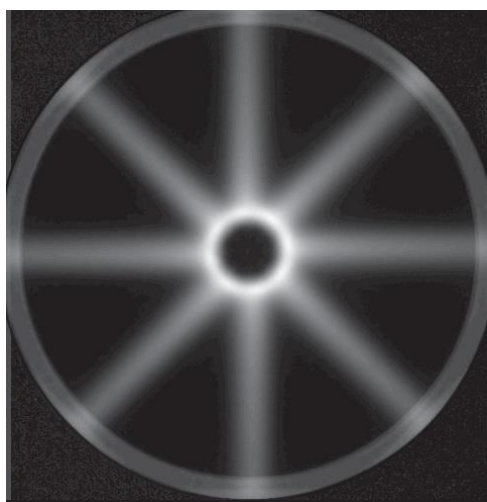
Single beams and single axis proton spot scans may be directed at the scintillator disk from any gantry orientation for capture and measurement. Complex proton arc deliveries are also supported. Automation scripts can be used to capture changes in the beam shape, intensity, location, and range depth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

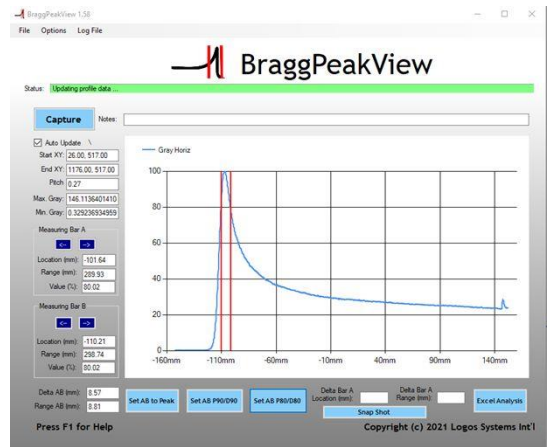


**Bragg Peak Star-Shot Delivery Integration**

## ARC-200 Operation

The ARC-200 phantom may first be imaged with a CT scanner so that the fiducials can be used as a target for the treatment volume. Every beam of the test QA plan can then be measured for delivery accuracy. The ARC technology uses a scintillator to turn the invisible X-rays or protons into a path of visible light that accurately represents the location and profile of the beam. A sensitive USB3 camera then digitizes the beam path moving the bitmap to the ARC computer for analysis and storage.

The BeamWorks Strata software is used to acquire and analyze ARC images. Beam data is displayed in 3D allowing real-time zoom and viewing angle selection. Beam height, width, penumbra, symmetry, and range measurements are available from any angle of gantry rotation. Spreadsheet macros are provided for extended statistical analysis of the captured data. Automated measurements can be made from the graphical user interface (GUI) or customized with an easy-to-use scripting environment.



## BraggPeakView Proton Range Analysis

### ARC-200 Specifications:

#### Accuracy: <sup>1</sup>

XY Beam Center:	0.2 mm
Repeatability:	±0.04 mm (typical)
Beam Diameter:	0.2 mm
Repeatability:	±0.04 mm (typical)
Proton Range:	0.8 mm
Repeatability:	±0.4 mm (typical)

#### Optical System: <sup>1</sup>

Resolution:	1200 x 1200 pixels with 8 or 12-bits per pixel CMOS
Capture Rate:	0.1- 400 frames/sec
Scintillator Size:	55 x 200 mm dia. (Glass) 55 x 190mm dia. (Plastic)
Camera Interface:	USB 3.0 via Fiber Optic

#### Camera Shielding: <sup>2</sup>

Camera top and sides:	12.7 mm thick bismuth and polymer composite
CCD Lifetime:	~1,500 X-ray beam hours

#### Camera Module Physical:

H x W x D:	24 x 22 x 45 cm
Weight:	7.0 kg (15.5 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:

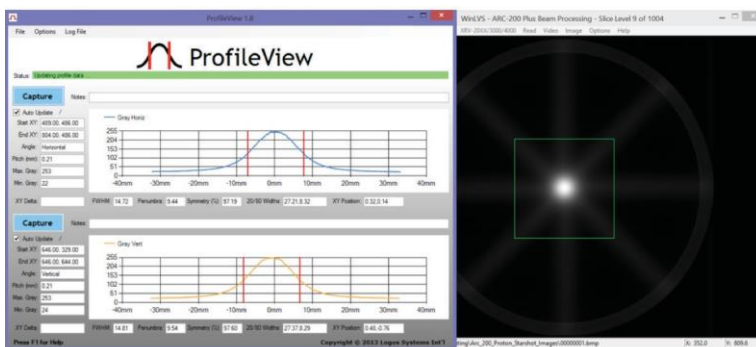
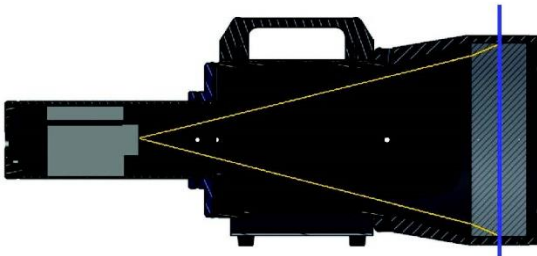
Electrical Power:	110V, 2 or 4A
Environment:	10 to 30 degrees C; 90% humidity, no condensation; minimal vibration

#### NOTES:

- Contact us for higher camera resolutions or larger scintillators.
- Contact us for custom shielding requirements. The camera may be replaced for a service fee after approximately 3 years as necessary.
- Contact us for treatment couch mounting solutions.

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The 55 x 200 mm scintillator turns the X-ray or proton beam (blue) into a visible light (yellow) that is captured by the camera and processed in the ARC-200 software.



Fast isocenter and beam diameter measurements

