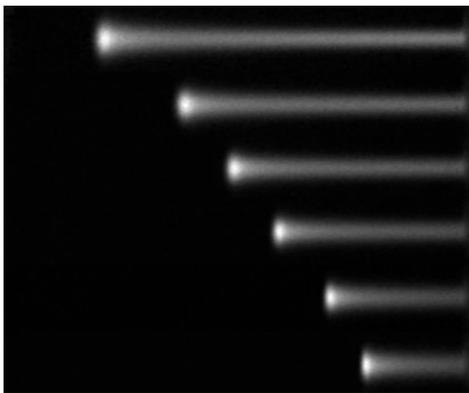


Falcon Ranger Proton Energy Verification

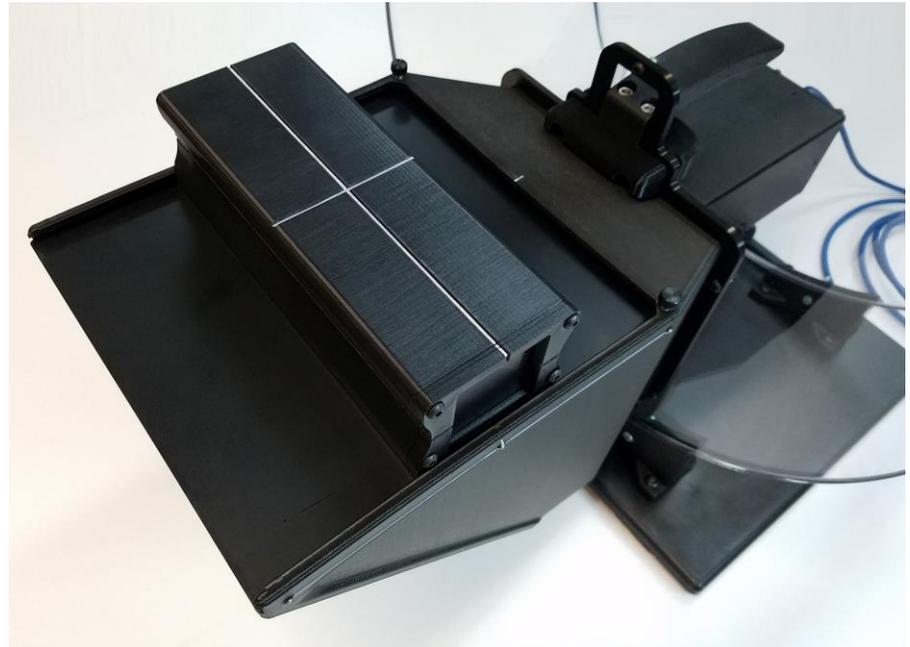
Proton and X-Ray Beam Metrology — Logos Systems Int'l

Features and Benefits:

- **Fast Bragg peak measurement of proton and heavy ion beams up to 35 mm in diameter**
- **Compatible with FLASH dose rates**
- **50 – 240 MeV proton beam measurement range**
- **R100, P80 – D80, and D80 – D20 Measurements**
- **Accuracy better than 1.0 mm**
- **Falcon Gantry Cradle compatible**
- **Easy handling for use at all gantry angles**
- **Thin sample WET measurement with 0.2-millimeter resolution**
- **BraggPeakView software for image analysis and measurement**
- **Advanced Excel analysis templates included**
- **Flexible automated script image capture**



Proton beam Bragg peak images



Ranger mounted on XRV-2000 Falcon with Gantry Cradle

The Falcon Ranger is a module that mounts to the XRV-2000 Falcon for the purpose of imaging and measuring the Bragg peak of proton and heavy ion beams.

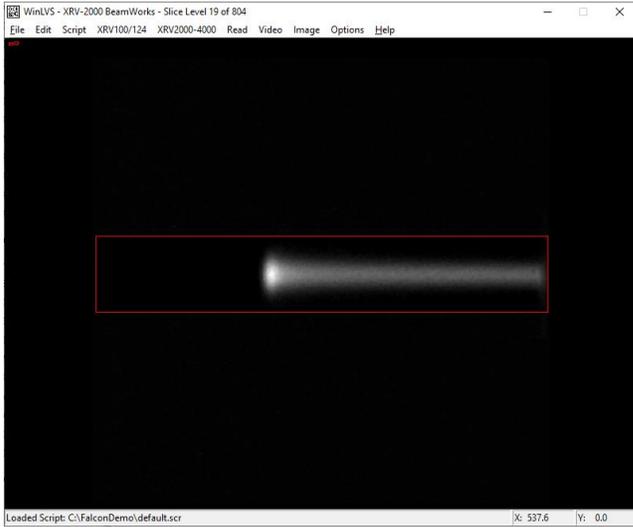
The Ranger is oriented such that the hadron beam enters the end of a scintillator block that is about 190 mm long and has a water equivalent thickness of approximately 1.9. As the ions slow down, light is generated and the beam image is reflected off the phantom's mirror to the USB camera.

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 0.21 mm per pixel. The camera field of view in that orientation is 910 pixels.

The entry of the Ranger is a 1.6 mm thick opaque window of PMMA plastic. The maximum water equivalent range with no buildup is approximately 360 mm. Build-up material may be inserted at the entry for extended range measurements.

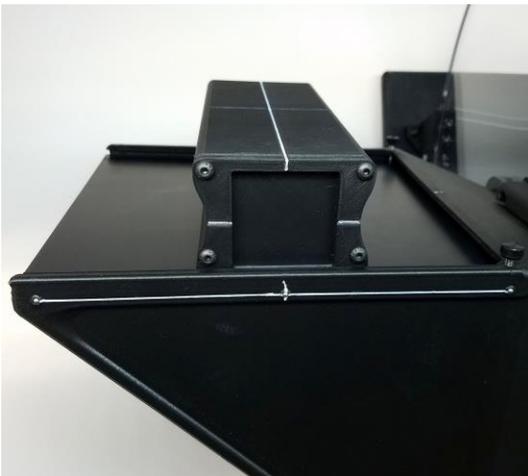
The 50 mm height of the scintillator block allows images of beams up to 35 mm in diameter to be captured and measured by the Falcon. For similar functionality with the XRV-3000 Eagle and XRV-4000 Hawk, the Ranger-300 is recommended. Please contact us for custom configurations of the Ranger design.

The WinLVS software supplied with the Falcon interfaces to the CCD camera in the phantom and is responsible for capturing images at rates from 1 to 30 frames per second under script or user interface control. The BraggPeakView measurement software accesses WinLVS several times per second, transferring the integrated proton path and Bragg peak region profile into its chart and local memory.

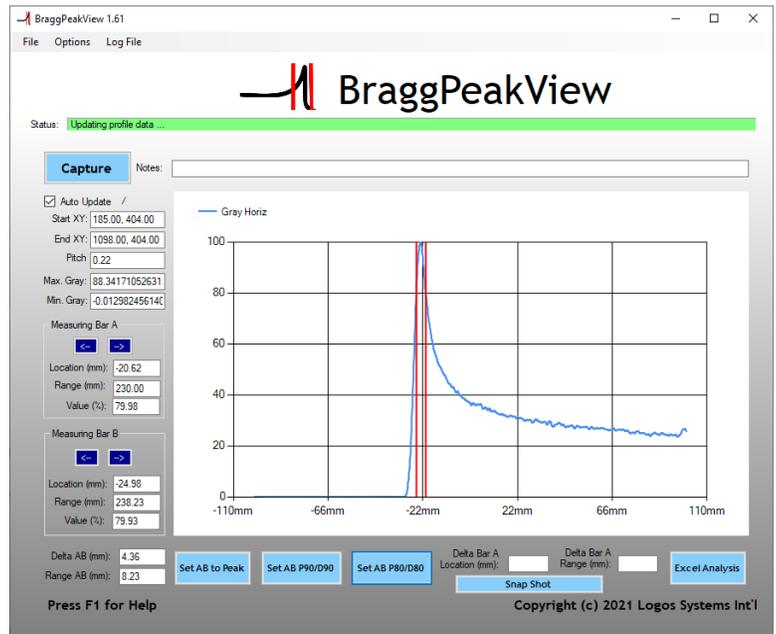


WinLVS captures Bragg peak image sequences up to 30 FPS

The BraggPeakView software displays the WinLVS captured image in a variety of formats including options that convert the quenched scintillator image profile into a pristine Bragg peak curve. A variety of buttons and controls can be used to manually or automatically measure proximal and distal features on the Bragg peak curve.



Closeup of beam entry window with alignment markings.



BraggPeakView software with measuring bars at P80/D80

After a delivery of several energies, the BraggPeakView autolog feature allows the user to measure P80/D80, P90/D90, or R100 for any number of beams at once, and export them into a pre-configured spreadsheet template in order to compare every delivered energy to baseline Bragg peak penetration depths. Energy estimations based on captured data are also available.

Falcon Ranger Specifications:

Accuracy:

Repeatability: ±0.2mm (typical)

Compatible Optical Systems*:

XRV-2000 Falcon 1.0mm R100
1280 x 960 pixels
200x200mm

Scintillator Properties:

H x W x D*: 55 x 58 x 190 mm
Target Window: 44.5 x 44.5 mm
Nominal Density: 2.23 g/cc
Refractive Index: 1.47

Weight:

XRV-2000 Falcon: 2.0 kg
Falcon Ranger: 0.9 kg

Required Software:

BeamWorks Strata V5.0
WinLVS V10.7
BraggPeakView V1.61
Excel

*Contact us for other scintillator options or for use on the Eagle or Hawk

1/19/2022