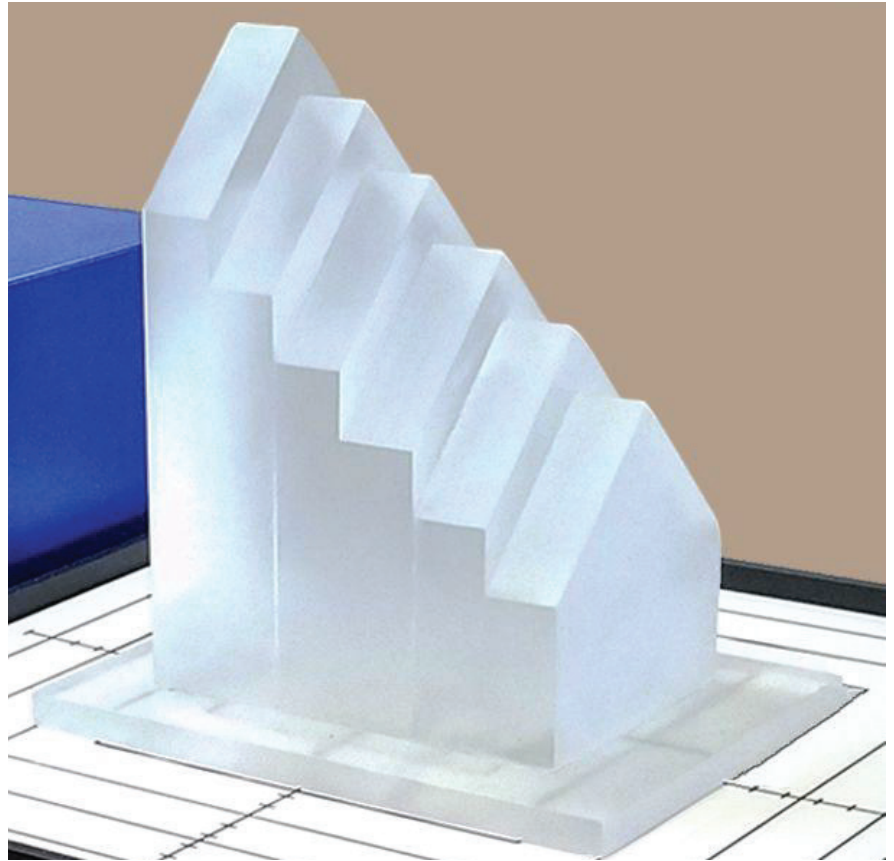


# Logos Chevron Wedge 200

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

## Features and Benefits:

- Fast Bragg peak measurement of water equivalent Proton beam range up to 235 mm
- 212 mm tall
- Acrylic (PMMA) composition
- Regular 100 x 70 mm and plus-size 100 x 140 mm footprints
- Accuracy better than 0.5 mm
- Measures Proton and X-ray beam depth-dose relationships
- Mounting hardware available for XRV-2000/3000/4000
- Easy handling for use at all gantry angles
- Compatible with film
- Automated image analysis and software measurement
- 35 energy layer Excel analysis template provided



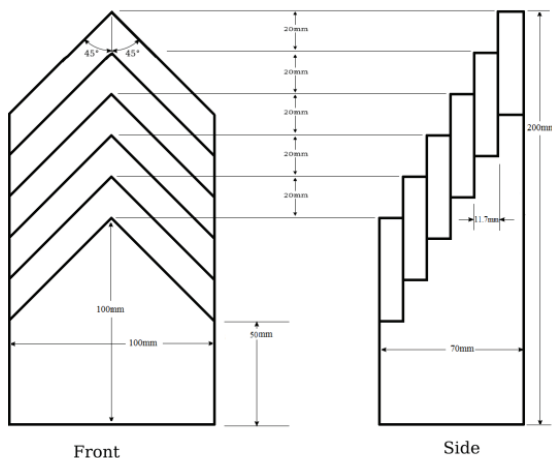
## LCW-200P with XRV Scintillator Camera Phantom

The LCW-200 is an acrylic (PMMA) dual wedge that can be used to measure Proton beam and X-ray depth-dose relationships. It was designed to quickly provide accurate proximal edge measurements of an ion beam's Bragg peak penetration range. The height of 212 mm allows proton beam equivalent penetration depths in water of up to 235 mm to be directly captured and measured.

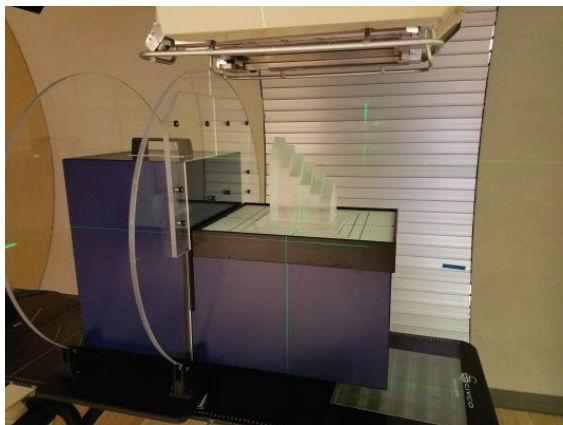
The chevron wedges overlap so that measurements on the edge of one range can be duplicated at the beginning of the next. The wedge angle of 45 degrees enables symmetrical measurements to be made on each side of the center line and averaged for greater precision.

The 100 x 70 mm footprint allows the LCW-200 to be mounted securely above the scintillator of the XRV. The LCW-200P has wider chevrons (24 mm) and is recommended for the XRV-2000 Falcon, XRV-3000 Eagle, and XRV-4000. Mounting hardware firmly locks the LCW above the XRV target so that measurements can be easily made at any angle by rotating the phantom in its gantry cradle.

The acrylic (PMMA) composition of the LCW-200 has a water equivalent density of 1.17 for direct measurements of Bragg peak Proton depths up to 235 mm. More energetic beams can be accommodated by padding the bottom surface with additional acrylic or tissue equivalent plastic. The patent pending design may be enhanced with additional chevrons, so please contact us for custom configurations.

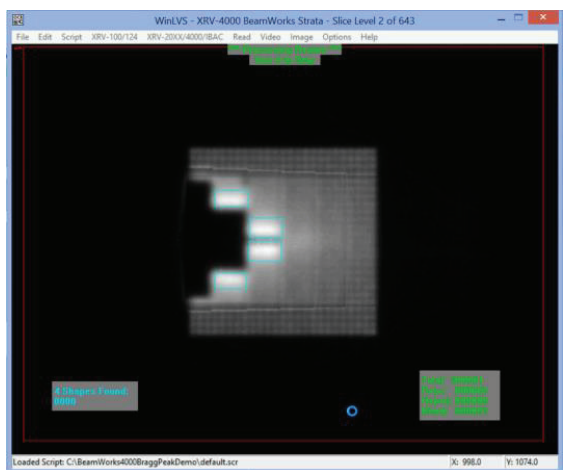


LCW-200 Dimension Diagram



### LCW-200P with XRV-4000 Scintillator Camera Phantom

The LCW-200P acrylic (PMMA) dual wedge has 24 mm thick chevrons yielding an overall footprint of 100 x 140 mm.



### Automated Capture and Measurement within WinLVS

The WinLVS capture software has a built-in scripting language that facilitates automatic real-time capture of the multi-energy even-dose delivery pattern needed for Bragg peak measurements.

After each layer has been delivered, WinLVS merges the captured PBS image streaks to form complete radiographs. Once the 35 layers of the plan have been delivered, the Bragg peak regions on the radiographs are isolated and measured with the CSV formatted data being output to file. This CSV file can then be imported into an Excel template where the Bragg peak penetration depths are calculated.

### LCW-200P/XRV-4000 Data from two deliveries of the same 35 layer even-dose diagnostic plan starting at 189 MeV and ranging downwards to 121 MeV:

LCW-200P Chevron PBS Proton Beam Bragg Peak Data Summary												
Plan	Post Snout		Delivery A Data (BPD = Bragg peak Penetration Depth)						Delivery	BPD Difference		
Layer	Energy (MeV)	Energy (MeV)	Change	Chevron BPD (mm)	Change	Mathematical BPD (mm)	Change	Delta BPD (mm) value	(Absolute)	B Delta	between Delivery A and B (mm)	
1	189	187.2		229.209		230.5681		1.359083	1.359083	1.219975	0.139108	
2	187.1	185.3	-1.9	225.5437	-3.6653	226.465	-4.10312	0.921263	0.921263	0.780438	0.140824	
3	185.2	183.4	-1.9	221.1806	-4.36309	222.3937	-4.07126	1.213098	1.213098	1.072281	0.140816	
4	183.3	181.5	-1.9	217.66	-3.52064	218.3544	-4.03932	0.694418	0.694418	0.837044	0.142626	
5	181.4	179.6	-1.9	213.8899	-3.77006	214.3471	-4.0073	0.457176	0.457176	0.385849	0.071327	
6	179.5	177.7	-1.9	210.2054	-3.68455	210.3719	-3.9752	0.166523	0.166523	0.380364	0.213841	
7	177.5	175.7	-2	206.2218	-3.98356	206.2223	-4.14966	0.000421	0.000421	0.071623	0.071201	
8	175.6	173.8	-1.9	202.3213	-3.90055	202.3132	-3.90906	-0.00808	0.008084	0.007566	0.000518	
9	173.6	171.8	-2	198.47	-3.85133	198.2334	-4.07985	-0.2366	0.2366	0.308172	0.071572	
10	171.6	169.8	-2	194.271	-4.19894	194.1895	-4.0439	-0.08156	0.081556	0.06316	0.018397	
11	169.6	167.8	-2	190.2904	-3.98058	190.1816	-4.00785	-0.10883	0.108828	0.108594	0.000233	
12	167.6	165.8	-2	186.2387	-4.05175	186.2099	-3.9717	-0.02878	0.028781	0.02881	2.92E-05	
13	165.6	163.8	-2	182.3415	-3.89721	182.2744	-3.93545	-0.06702	0.067023	0.068309	0.001286	
14	163.5	161.7	-2.1	178.203	-4.13849	178.1814	-4.09309	-0.02162	0.021621	0.269923	0.248302	
15	161.5	159.7	-2	174.3163	-3.88672	174.3206	-3.8608	0.004303	0.004303	0.069978	0.065675	
16	159.9	158.1	-1.6	171.2277	-3.08857	171.2583	-3.0623	0.030565	0.030565	0.102261	0.071697	
17	158.3	156.5	-1.6	168.4256	-2.80212	168.2194	-3.03884	-0.20615	0.206148	0.134575	0.071574	
18	156.7	154.9	-1.6	165.1103	-3.31526	165.2041	-3.01531	0.093807	0.093807	0.128988	0.035181	
19	155.1	153.3	-1.6	162.4706	-2.63967	162.2124	-2.99173	-0.25825	0.258251	0.184127	0.074124	
20	153.5	151.7	-1.6	159.3777	-3.0929	159.2443	-2.96808	-0.13343	0.133434	0.060379	0.073055	
21	151.9	150.1	-1.6	156.6548	-2.72291	156.2999	-2.94438	-0.3549	0.354901	0.280548	0.074354	
22	150.3	148.5	-1.6	153.4399	-3.21493	153.3793	-2.92062	-0.06059	0.060594	0.087639	0.027045	
23	148.1	146.3	-2.2	149.8192	-3.62067	149.4024	-3.97694	-0.41686	0.41686	0.342956	0.073904	
24	146.2	144.4	-1.9	146.0767	-3.7425	146.0041	-3.39826	-0.07262	0.07262	0.002941	0.069679	
25	143.6	141.8	-2.6	141.6569	-4.41986	141.4087	-4.59542	-0.24818	0.248176	0.098641	0.149536	
26	141.4	139.6	-2.2	137.6217	-4.03518	137.5699	-3.83876	-0.05176	0.051758	0.050477	0.001281	
27	139.1	137.3	-2.3	133.5789	-4.04278	133.6056	-3.96437	0.026653	0.026653	0.027015	0.000362	
28	136.8	135	-2.3	129.7561	-3.82282	129.6914	-3.9142	-0.06473	0.064734	0.011753	0.05298	
29	134.4	132.6	-2.4	125.7952	-3.96095	125.6607	-4.03068	-0.13447	0.134468	0.095365	0.039103	
30	132.1	130.3	-2.3	121.5329	-4.26226	121.8496	-3.81106	0.316733	0.316733	0.316623	0.00011	
31	129.7	127.9	-2.4	117.5707	-3.96217	117.927	-3.92259	0.356311	0.356311	0.35614	0.000171	
32	127.2	125.4	-2.5	113.7647	-3.80602	113.9001	-4.02695	0.135376	0.135376	0.212173	0.076797	
33	124.8	123	-2.4	109.7267	-4.03804	110.0912	-3.8089	0.364518	0.364518	0.287915	0.076603	
34	122.3	120.5	-2.5	106.0684	-3.6583	106.1832	-3.90796	0.114857	0.114857	0.114999	0.000141	
35	121	119.2	-1.3	103.5541	-2.51426	104.1752	-2.00799	0.621126	0.621126	0.620916	0.00021	
				Average	-3.92091			Average	0.269448		0.2625	
				Std. Dev.	0.224626			Std. Dev.	0.331476		0.301521	
								Max.	1.359083		1.219975	
								Min.	0.000421		0.002941	
				Total Depth:	125.6549 mm			Average Layer Depth:	3.695733 mm			

