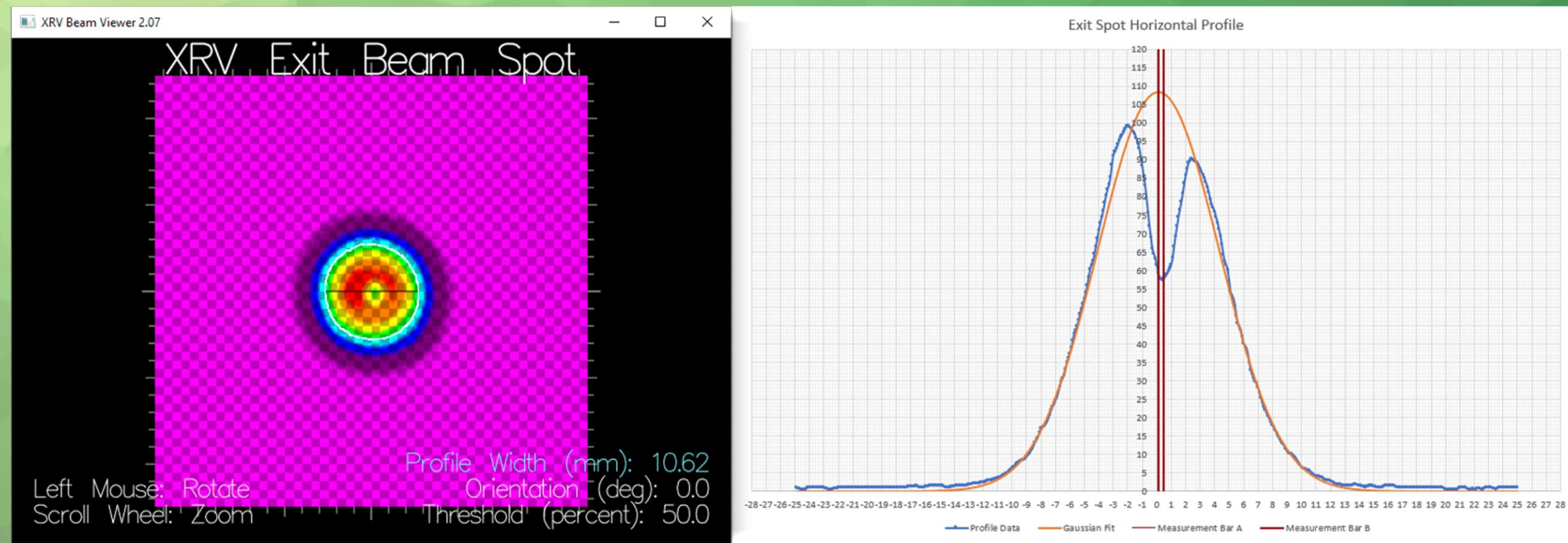
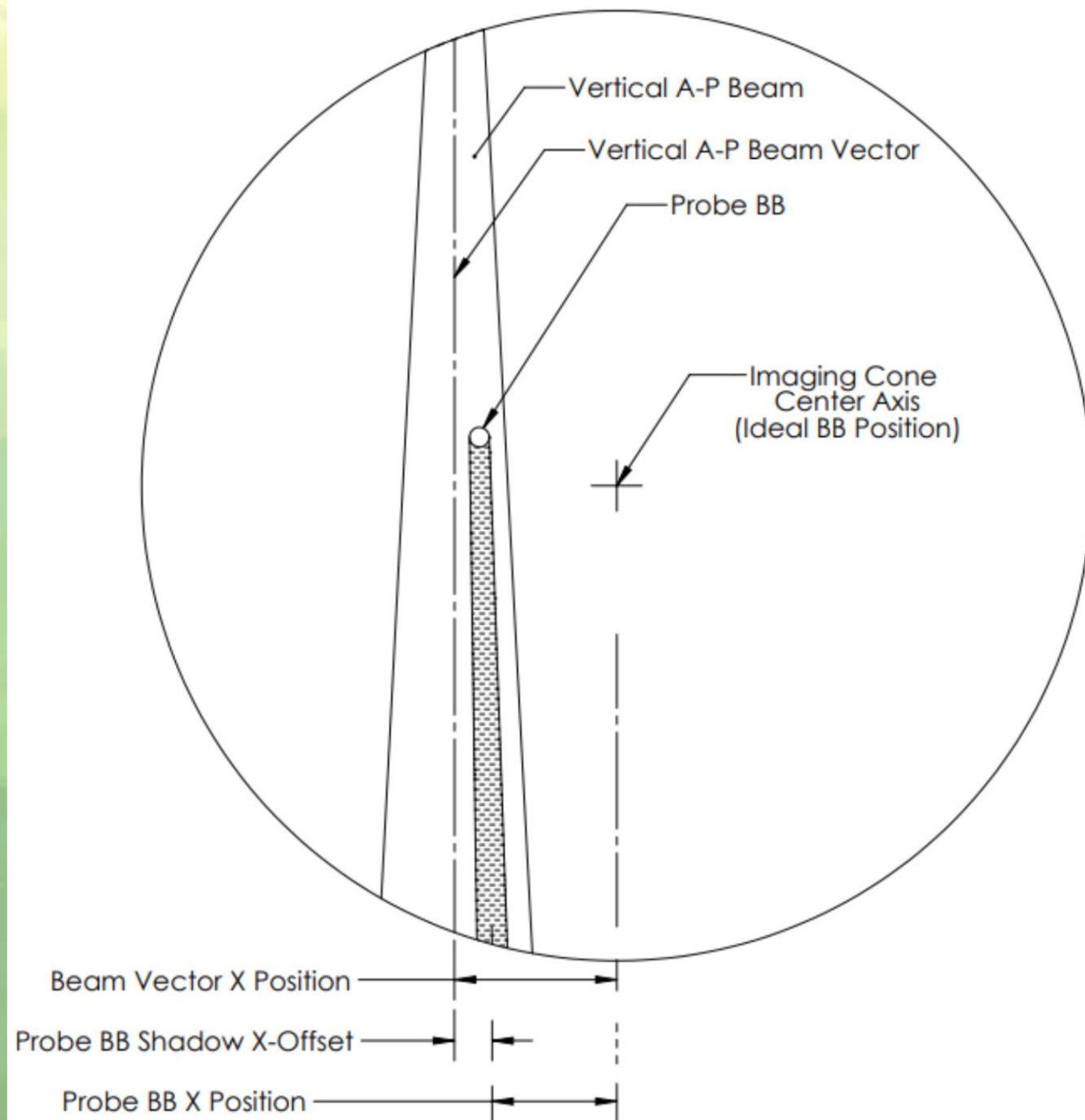


XRV-100/124 Target Distance Measurement with the BeamWorks Gaussian Fitting Module

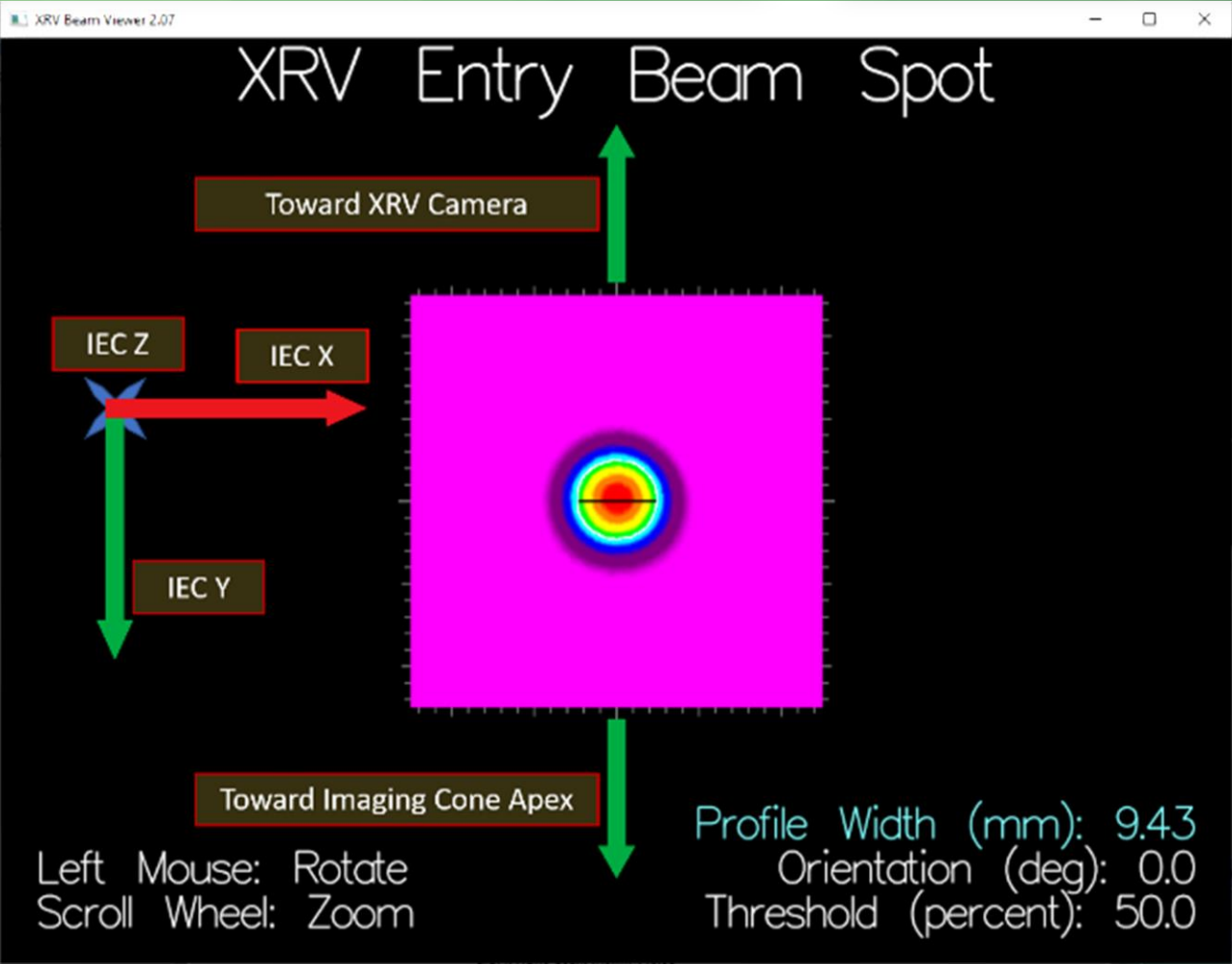
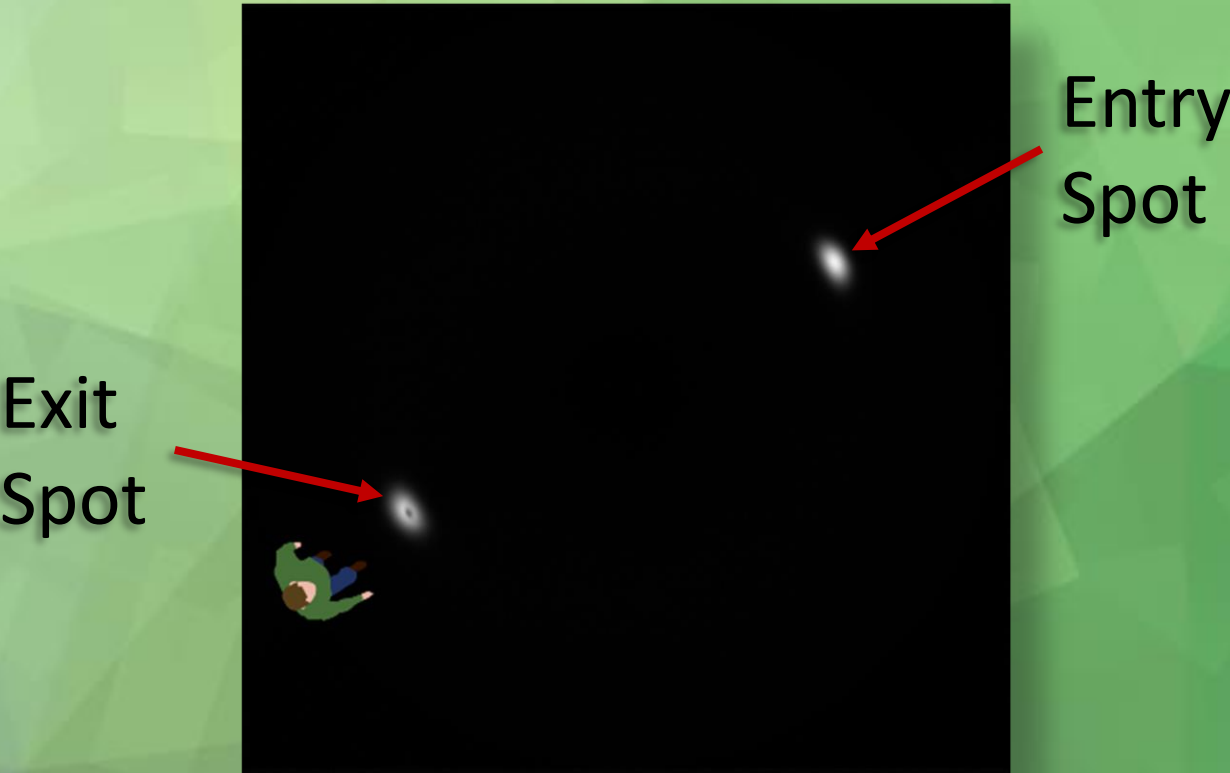
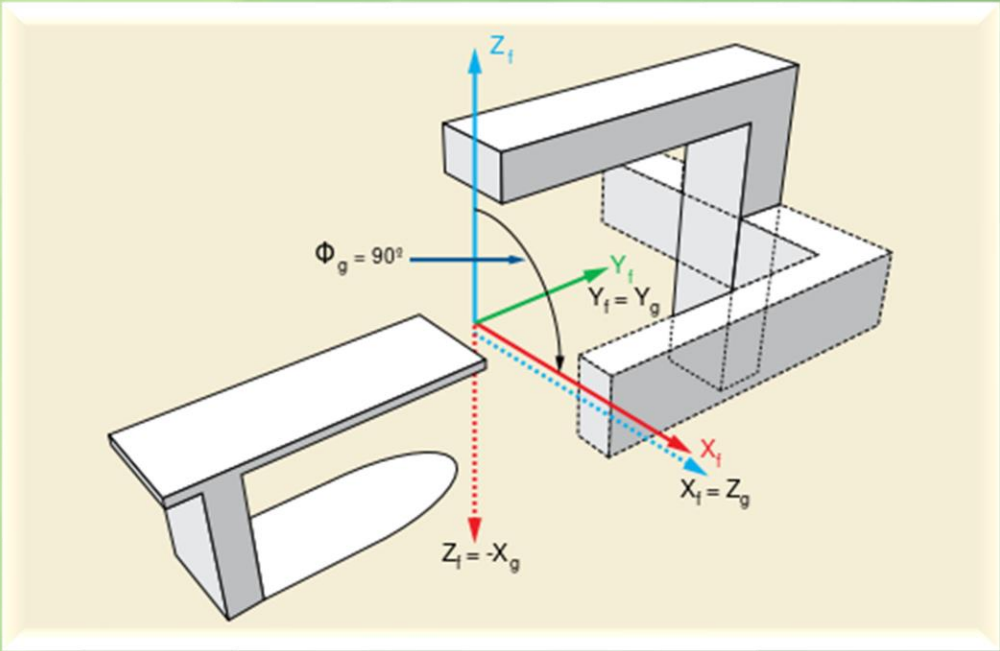




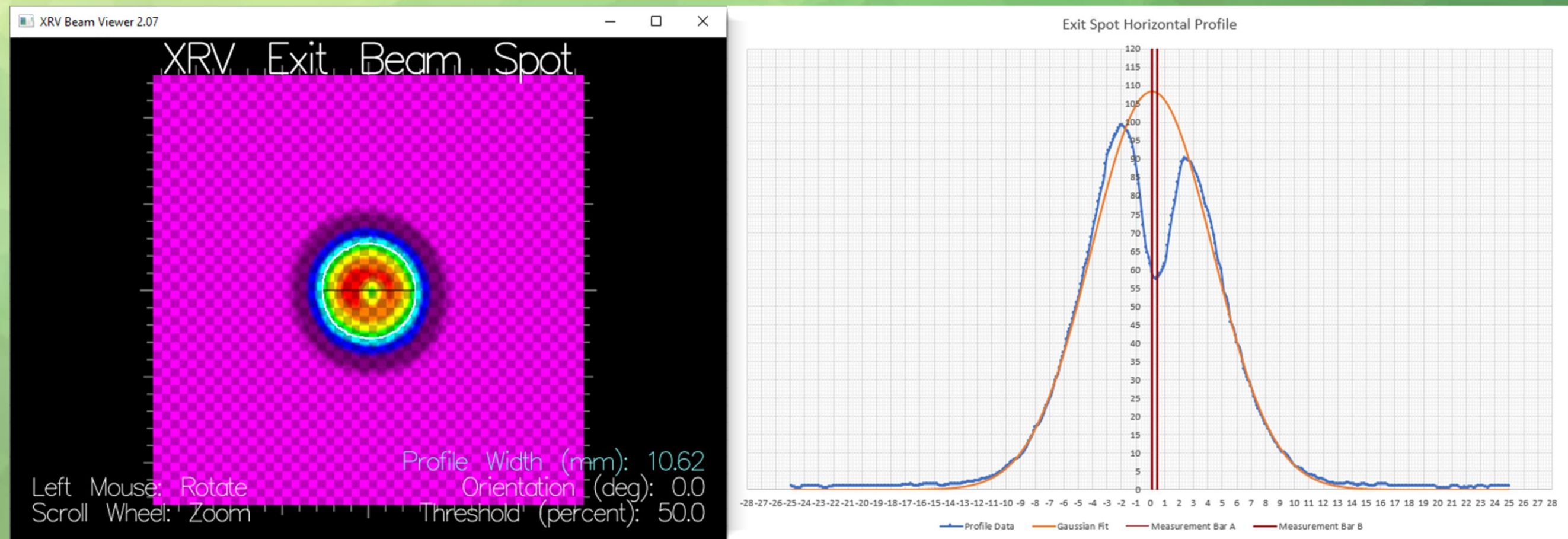
The distance of any beam vector from the Probe BB can be measured using the BB shadow offsets from beam center.

Additionally, the Probe BB spatial position itself can be verified from two known beam vectors by using these BB shadow offsets.

Each beam spot is oriented the same relative to IEC Gantry coordinates, as with a moving observer that always looks into the oncoming beam.

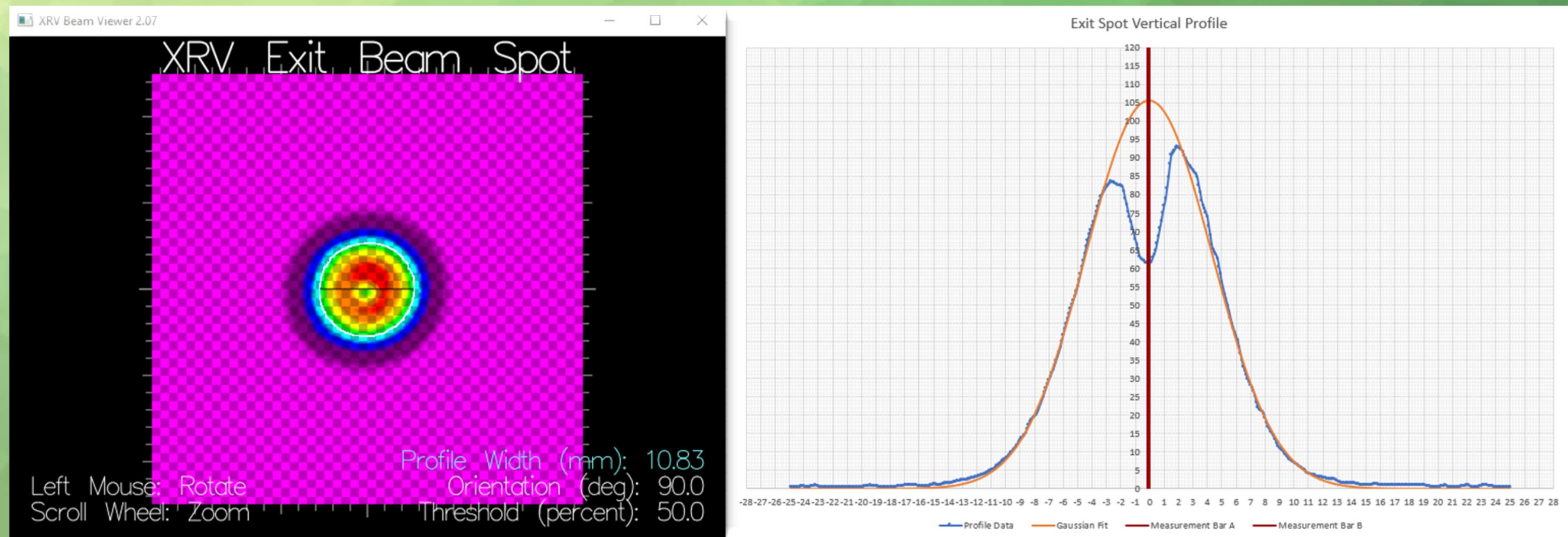


Therefore the Horizontal Profile and BB offset give us information about the Beam X position relative to the Probe BB...



Exit Horizontal Profile Curve Fit

and the Vertical Profile/BB offset give us information about the Beam Y position relative to the Probe BB.

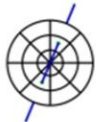


Exit Vertical Profile Curve Fit

To compute the Target distance for a single beam, run the Beam Spot Gaussian Fit Excel Analysis and clear the warning dialogue which highlights the presence of the Probe fiducial BB in the exit spot.

2D Gaussian Fit_02232022_01_05_PM.xlsm - Excel																		
File Home Insert Page Layout Formulas Data Review View Developer Add-ins Help DoneX SpreadsheetConverter Tell me what you want to do																		
M42																		
1	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
2	BeamSpot Profile Summary Solver Finished																	
3																		
4	Entry Spot						Exit Spot (XRV-100/124 only)						Average (cone center, XRV-100/124 only)					
5	σ_x	3.97	(mm)				4.77	(mm)					4.37	(mm)				
6																		
7	σ_y	3.92	(mm)				4.96	(mm)					4.44	(mm)				
8																		
9	σ_{Avg}	3.95	(mm)				4.87	(mm)					4.41	(mm)				
10																		
11	Symmetry (%)	99.31	(%)				98.07	(%)					98.69	(%)				
12	$100\% - (ax-ay) / (ax+ay) * 100\%$																	
13	Asymmetry (%)	0.69	(%)				1.93	(%)					1.31	(%)				
14	$ (ax-ay) / (ax+ay) * 100\%$																	
15	Gaussian FWHM	9.29	(mm)				11.46	(mm)					10.38	(mm)				
16	$\sigma_{Avg} * 2.35482$																	
17	Gaussian Penumbra	4.65	(mm)				5.73	(mm)					5.19	(mm)				
18	$\sigma_{Avg} * 1.17741$																	
19																		
20																		
21	Sum of weighted squared fit errors	539.304	Gaussian curve fitting successful.				45087.4	High fitting error detected. Check exit plots										
22	Peak Delta X	-0.59046	Gaussian curve fitting successful.				24.8271	Potential BB Shadow Detected. Check fit.										
23	Peak Delta Y	-0.59637	Gaussian curve fitting successful.				24.5711	Potential BB Shadow Detected. Check fit.										
24																		
25	Error Threshold:	2000																
26	Peak Delta Threshold:	5																
27																		
28	Beam Divergence Information																	
29		Ref. Hole	Z coord. (mm)	S1 (mm)	S2 (mm)	SAD (mm)	Theta (whole angle, degrees)											
30		F	125.14	523	646	585	0.86											
		Entry Horizontal	Entry Vertical	Exit Horizontal	Exit Vertical	Spot Profile Summary	Beam Divergence											

XRV-100/124 BeamWorks 2.55

BeamWorks

QA Plan CaptureQA Plan ReviewProfile ViewTrend AnalysisMLC/PBS Trend AnalysisScript ControlSettings

Beam 7 file data loaded successfully.

LoadSelect Capture Data for ReviewPreviousNext

C:\BeamWorksGaussianFittingDemo\2020_0123_0007

ReloadDisplay Current CaptureTarget XYZ (mm): 0.00 , 0.00 , 145.30Isofocus XYZ (mm): -0.19 , 0.30 , 145.63Isocenter XYZ (mm): -0.36 , 0.67 , 145.63

View Beam VectorsView Capture LogStyle: General IsocenterNotes:

Excel

Excel Analysis☐ Isocenter Trend☐ Dimensional Binning☒ Beam Spot Gaussian Fit☐ Open as CSV (No Template)

Beam

Data SummaryX: -0.36 mmY: 0.00 mmZ: 145.61 mmTheta: 90.22 degreesPhi: 89.91 degreesGantry Angle: -0.22 degreesArc Width: 10.01 mmRadial Width: 10.01 mm2D Width: 10.03 mmExit Gray: 191.78Entry Gray: 242.33Exit/Entry Gray Ratio: 0.791Target Distance: 0.476 mmFrame Count: 1Gray x Frame Count: 242.33Gray x Frame Count (Nom): 121.16

7 of 13View Beam Profiles

Press F1 for HelpCopyright © 2021 Logos Systems Int'l

Microsoft Excel

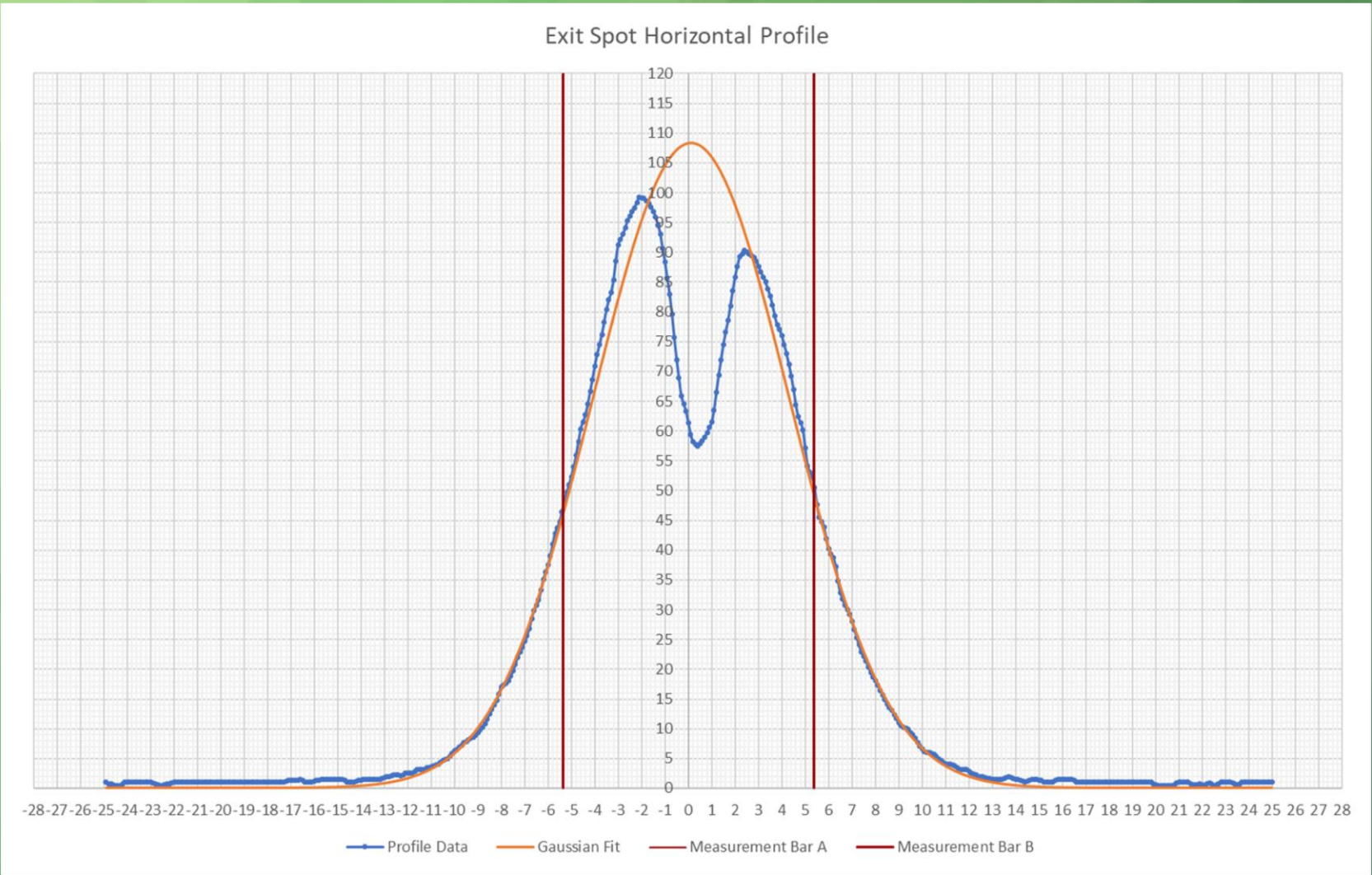
A fiducial BB shadow may be affecting the curvefit of the exit beam spot. Please review the 'Exit Horizontal' and 'Exit Vertical' plots. Exclude the central region by defining its boundaries, then set weighting to 'Tails Only' and re-solve.

OK

Re-solve the Exit Horizontal and Exit Vertical fits using the ‘Tails Only’ weighting preset to obtain a Gaussian fit of the exit spot profile.

These new fits represents what the exit spot profiles (especially sigma) would have looked like without the scattering effect of the probe fiducial BB.

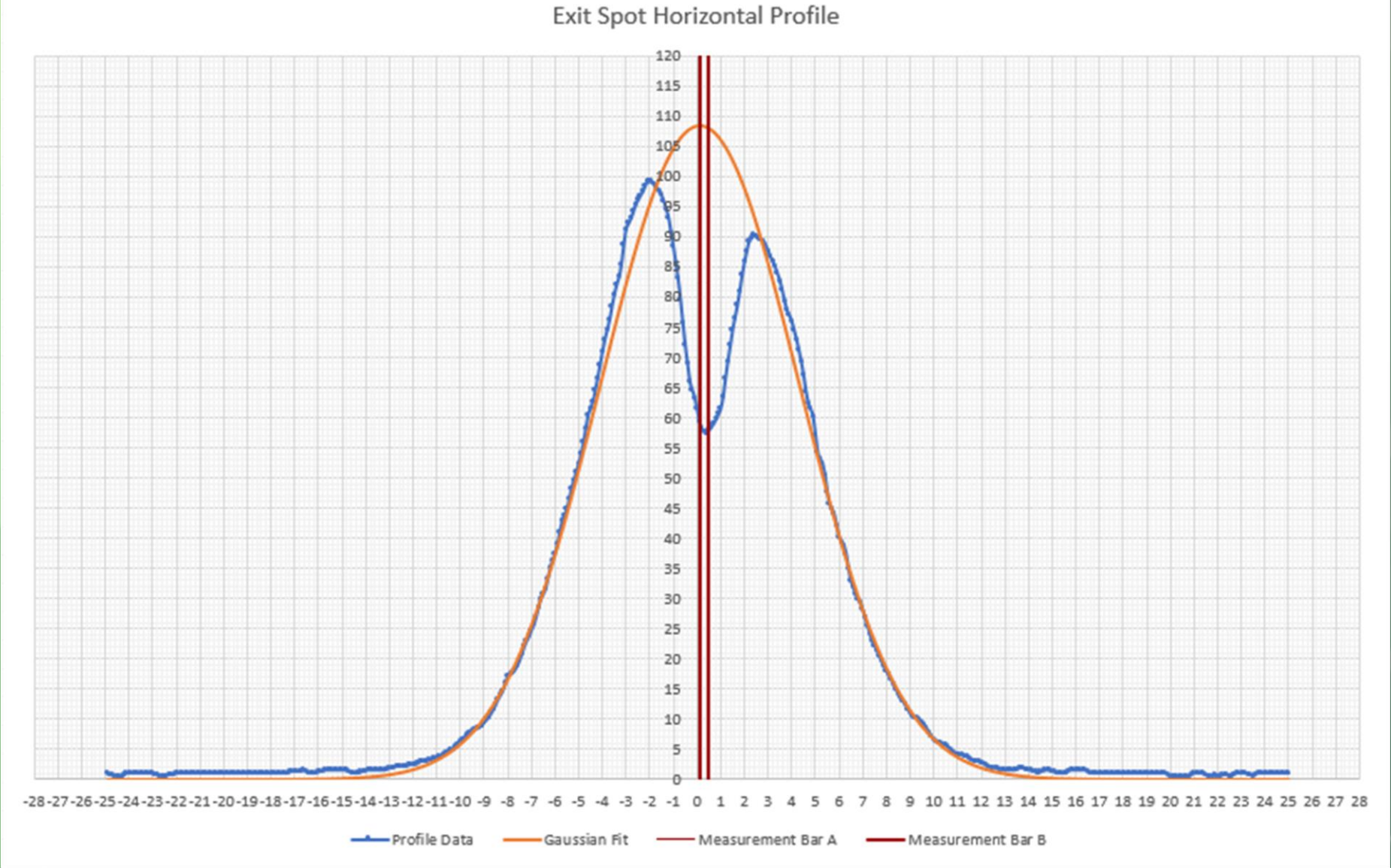
Gaussian Fit Parameters		Measurement Bar Controls (define weighting regions and measure features)						Weighting Presets:			
		Show bars on plot?				on	Tails Only				
A:	108.359335	Meas. Bar A		<<	<	-5.37	>	>>	Center Weight	0.00	Tail Heavy
mu:	251.181821	Meas. Bar B		<<	<	5.37	>	>>	Tail Weight	1.00	Default (Even Weight)
sigma (pixels):	41.8763966	Reset to FWHM						Center Heavy			
Sigma (mm)	4.188	Set Peak/Trough						Center Only			
Sum Error sq.:	302.9299514	Delta B-A (mm)		10.73		Recalculate Fit					
Profile FWHM (mm)	9.862										



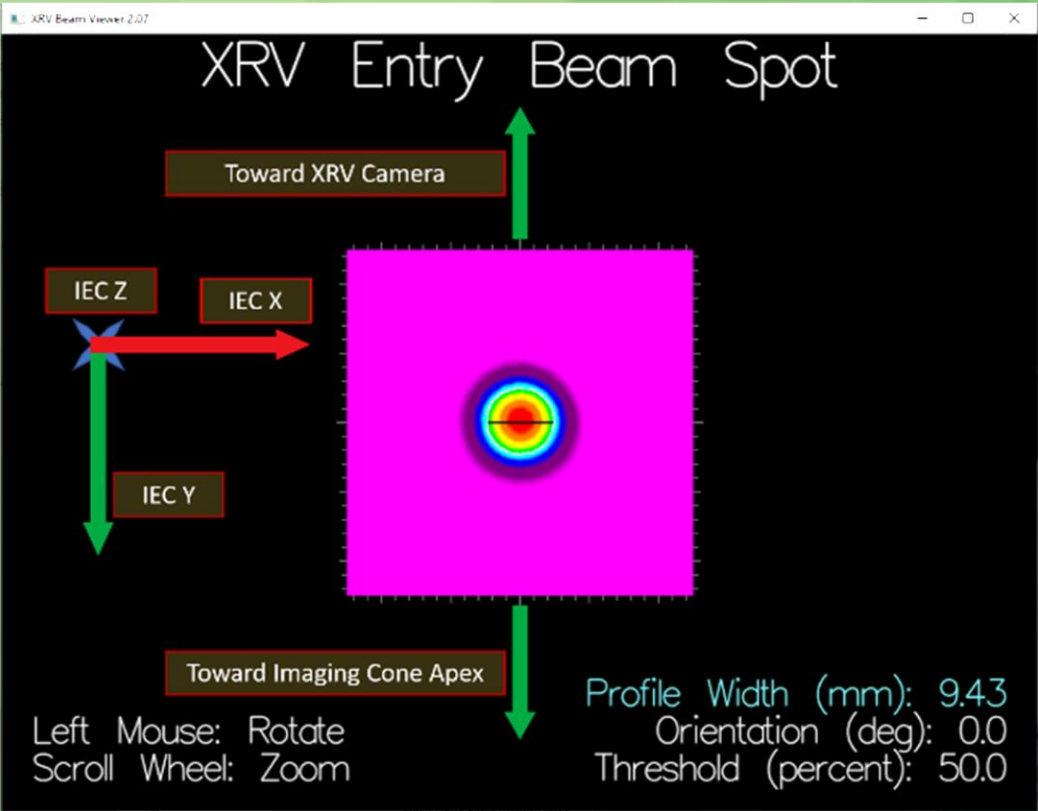
Set the Measurement Bars A and B to the Gaussian fit peak and the BB shadow trough respectively.

The #7 (AP) beam has missed the BB by $\Delta x = -0.30\text{ mm}$, since the beam passed to the left of the Probe BB.

Gaussian Fit Parameters		Measurement Bar Controls (define weighting regions and measure features)				Weighting Presets:	
A:	108.359335	Show bars on plot?		on		Tails Only	
mu:	251.181821	Meas. Bar A << < 0.15 > >>		Center Weight 0.00		Tail Heavy	
sigma (pixels):	41.8763966	Meas. Bar B << < 0.45 > >>		Tail Weight 1.00		Default (Even Weight)	
Sigma (mm)	4.188	Reset to FWHM				Center Heavy	
Sum Error sq.:	39632.23906	Set Peak/Trough				Center Only	
Profile FWHM (mm)	9.862	Delta B-A (mm)		0.30		Recalculate Fit	

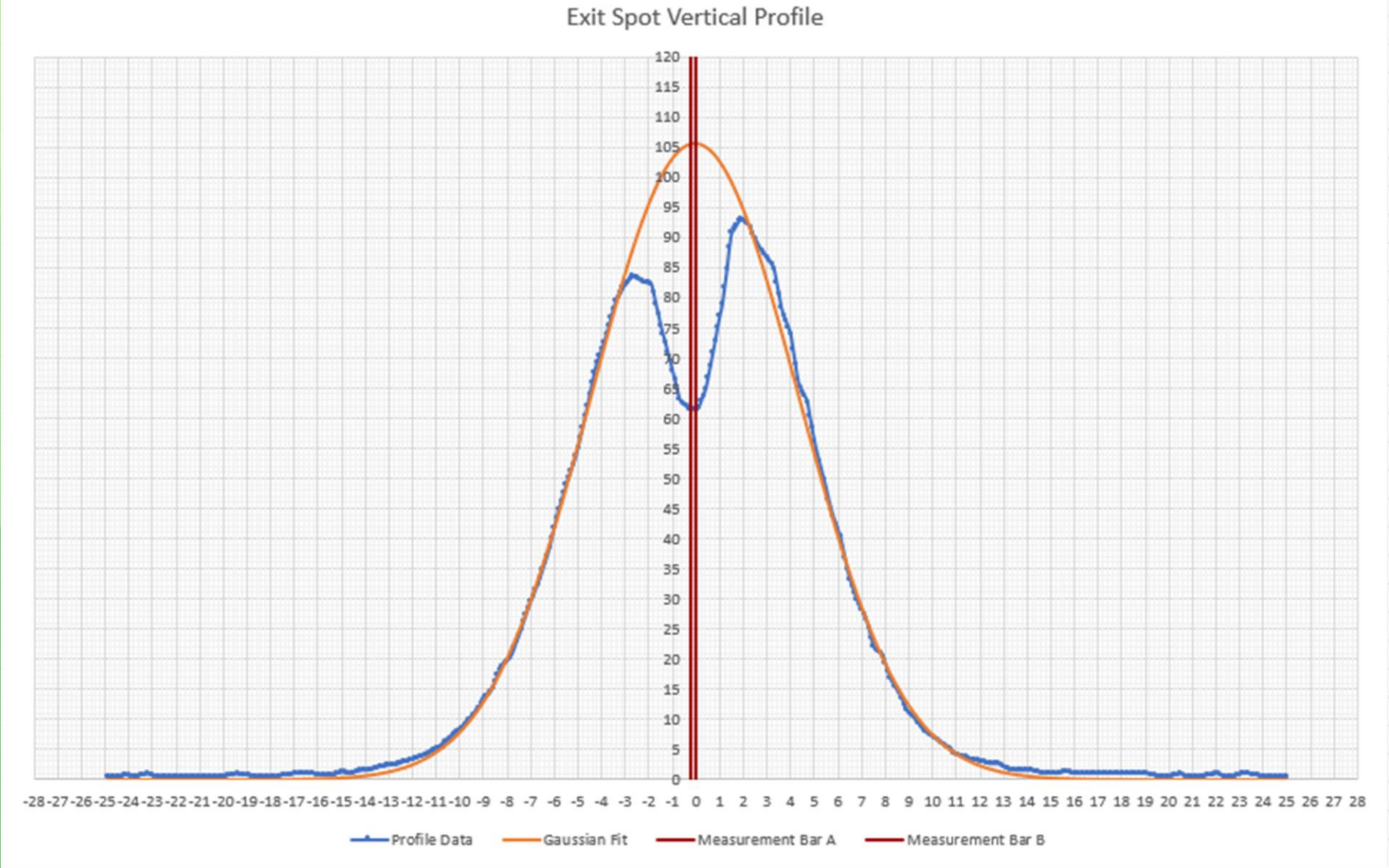


Exit Horizontal Profile Curve Fit

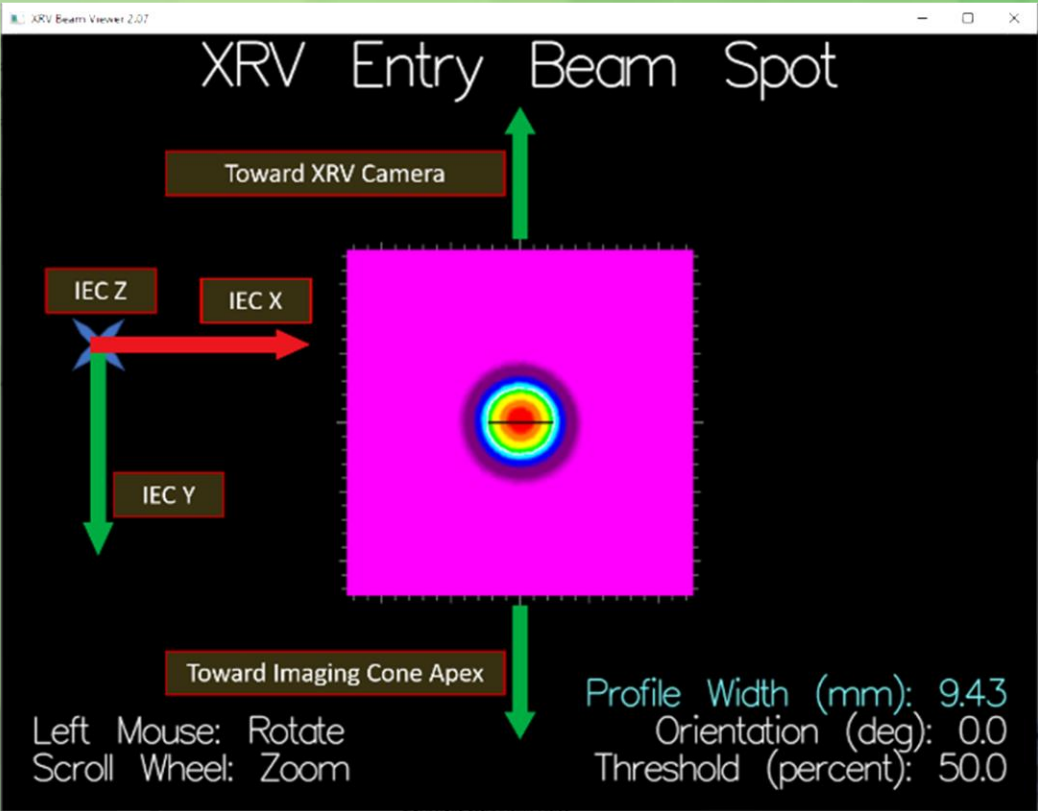


The #7 (AP) beam has missed the BB by $\Delta y = + 0.15 \text{ mm}$, since the beam passed to the to the right of the Probe BB.

Gaussian Fit Parameters		Measurement Bar Controls (define weighting regions and measure features)						Weighting Presets:	
		Show bars on plot?		on				Tails Only	
A:	105.5109585					Center Weight	0.00	Tail Heavy	
mu:	249.4377219	Meas. Bar A	<<	<	-0.05	>	>>	Tail Weight	1.00
sigma (pixels):	43.64140796	Meas. Bar B	<<	<	-0.20	>	>>	Default (Even Weight)	
Sigma (mm)	4.364			Reset to FWHM				Center Heavy	
Sum Error sq.:	38609.82781			Set Peak/Trough				Center Only	
Profile FWHM (mm)	10.278	Delta B-A (mm)			-0.15	Recalculate Fit			



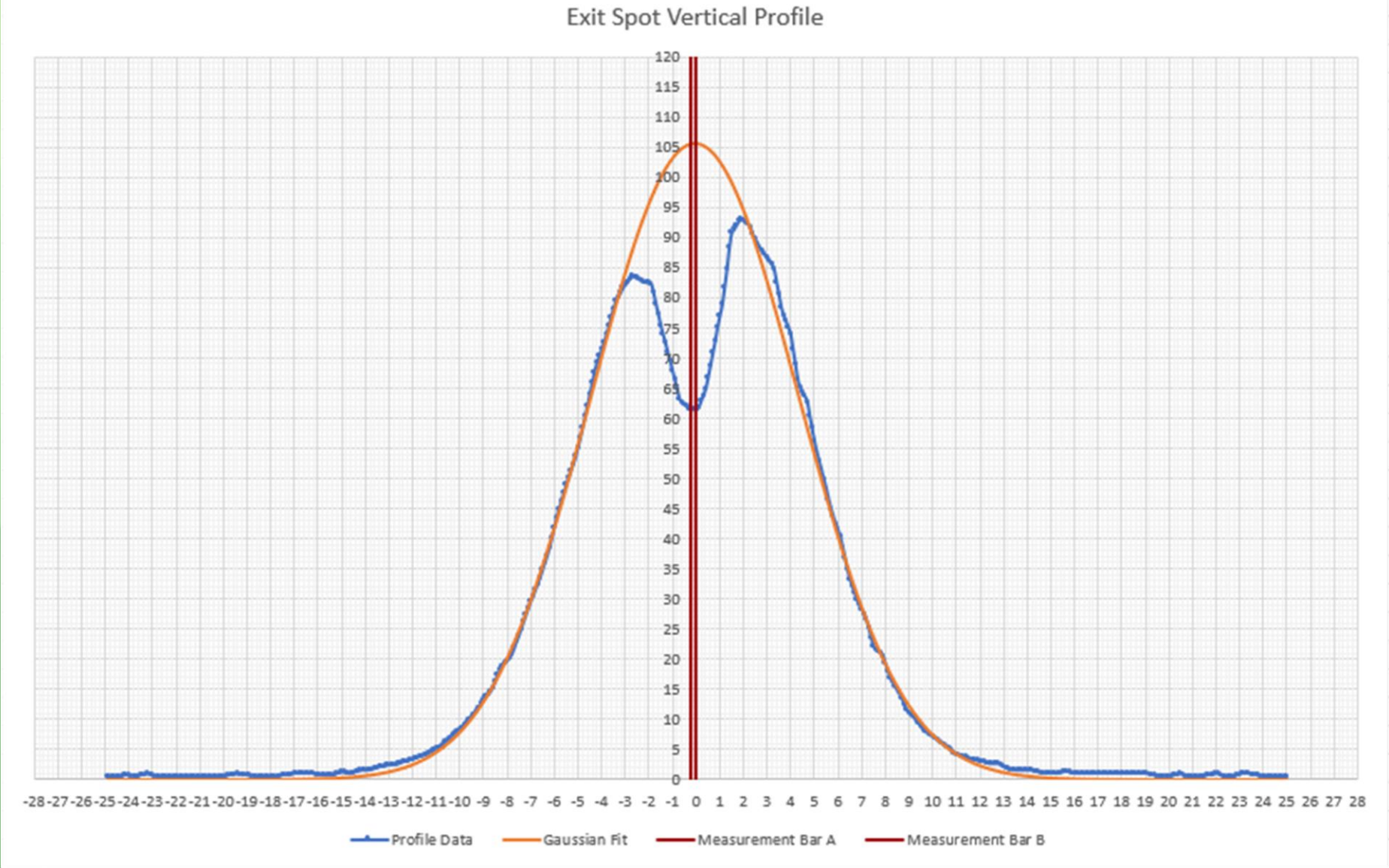
Exit Vertical Profile Curve Fit



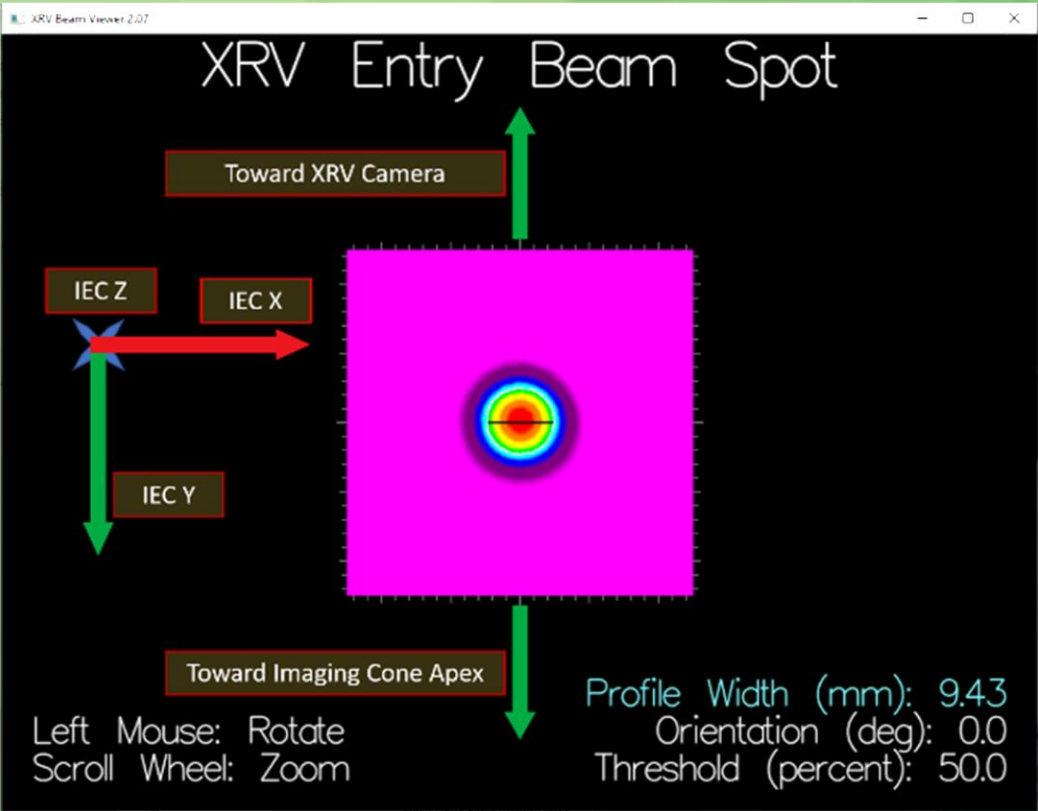
The total XY offset distance d is calculated as:

$$d = \sqrt{\Delta x^2 + \Delta y^2} = 0.34 \text{ mm}$$

Gaussian Fit Parameters		Measurement Bar Controls (define weighting regions and measure features)						Weighting Presets:	
		Show bars on plot?		on				Tails Only	
A:	105.5109585					Center Weight		0.00	Tail Heavy
mu:	249.4377219	Meas. Bar A	<<	<	-0.05	>	>>	Tail Weight	1.00
sigma (pixels):	43.64140796	Meas. Bar B	<<	<	-0.20	>	>>		Default (Even Weight)
Sigma (mm)	4.364			Reset to FWHM				Center Heavy	
Sum Error sq.:	38609.82781			Set Peak/Trough				Center Only	
Profile FWHM (mm)	10.278	Delta B-A (mm)			-0.15	Recalculate Fit			



Exit Vertical Profile Curve Fit

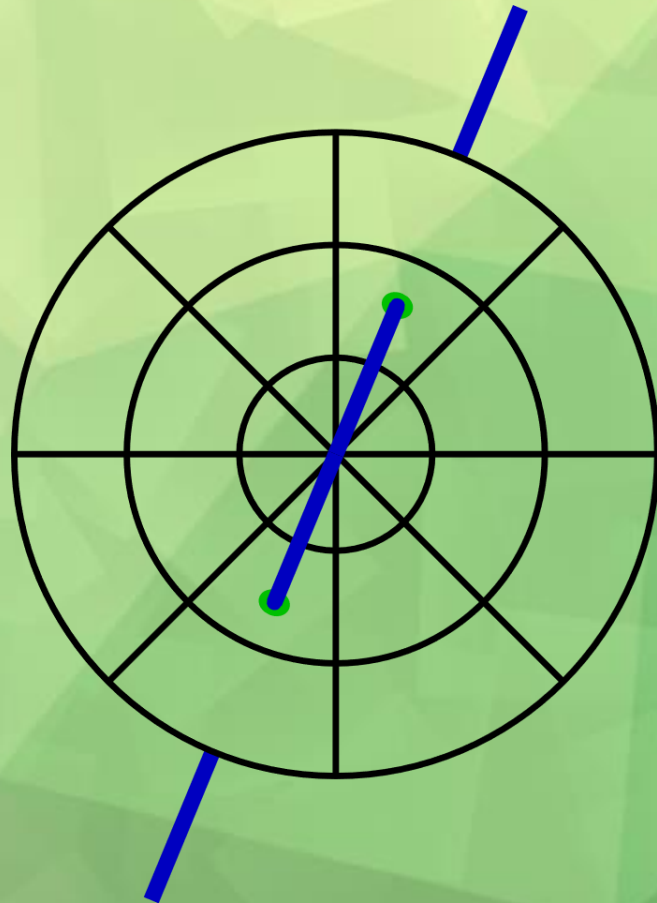


Since the exit spot profiles have been recalculated to compensate for Probe BB scattering, the summary page now contains accurate Gaussian sigma XY values for the beam spots, as well as distance from the virtual source and divergence angle for the selected beam.

2D GaussianFit_02252022_10_32_AM.xlsm - Excel

Sign in

Digital Real-Time X-ray and Proton Beam Metrology Solutions



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